REPORT FOR
KISSIMMEE - EVERGLADES AREA
FLORIDA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
RIVER BASINS INVESTIGATIONS

4-30265 4-72
USDA-SCS-FT. WORTH, TEXAS 1972

REPORT

KISSIMMEE-EVERGLADES AREA
FLORIDA

U. S. DEPARTMENT OF AGRICULTURE

RIVER BASIN INVESTIGATION

United States Department of Agriculture
In Cooperation With
Division of Interior Resources
Florida Department of Natural Resources

1973

4-30265 5-73
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KISSIMMEE-EVERGLADES AREA

Use and Development of Land and Water Resources for Agriculture

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U. S. DEPARTMENT OF AGRICULTURE
USE AND DEVELOPMENT OF LAND AND WATER RESOURCES

KISSIMMEE-EVERGLADES AREA, FLORIDA

S U M M A R Y

The Kissimmee-Everglades Area encompasses 17,664 square miles (11,305,200 acres) of land and water. There are 1076 square miles of fresh water streams and lakes and 886 square miles of salt or brackish water streams and estuaries. Agricultural and forestry enterprises occupy 11,306 square miles of land in the Basin. Non-agricultural land, including urban, industrial, rights-of-way, airports, golf courses and other similar uses, occupy 4396 square miles.

Economic development within the Basin during the past two decades has been more rapid than that experienced nationally. This is evident from population growth, expansion of employment opportunities and personal income. The Basin's population between 1950 and 1970 more than tripled while national population increased by one-third. Population in the Basin in 1970 totaled 2.8 million. Average per capita income in 1968 was $3534 which was higher than either the State or the national average.

The 1968 agricultural enterprises of the Basin include approximately 345,000 acres of citrus, 210,400 acres of vegetables, 206,800 acres of sugarcane, 20,200 acres of other crops, 1,116,900 acres of improved pasture, 1,948,500 acres of rangeland or unimproved pasture, 1,993,400 acres of forestland, and 1,394,000 acres of miscellaneous agricultural uses (including rural homesites, idle land and open wildlife areas).

The Basin produced approximately 36 percent of the State's citrus in 1968 or about 29 percent of the nation's production. All of the State's sugarcane, which represents 43 percent of the mainland cane sugar production and 52 percent of the State's winter vegetable acreage, is grown in the Basin. The Basin has 600,000 head of cattle which represents 33 percent of the State's total.

In 1968, 2.06 million acre-feet (670 billion gallons) of water was used for agricultural purposes with 94 percent being used for irrigation. Of the total 1.94 million acre-feet used for irrigation, 76 percent came from underground sources with 24 percent coming from surface supplies. This 1.94 million acre-feet of irrigation water was applied on 1.02 million acres of citrus, other crops and improved pasture.

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Water of suitable quality is inadequate for both agricultural and non-agricultural purposes in certain areas of the Basin especially in the counties bordering the coast. This quality deficiency is generally due to high mineralization of groundwater and the influence of highly mineralized pressure flows as well as tidal action on surface streams near the coast.

Excess water is a major limitation in the development of much of the land resources. Excess water hazards were the dominant problems on 6.96 million acres or 96 percent of the 7.24 million acres of agricultural land in 1968. Treatment measures have been applied on 1.56 million acres to reduce excess water hazards and 1.08 million acres have been treated to adequately remove all hazards. Projections indicate by 1980 the agricultural land base will be reduced to 7.05 million acres, of which 6.79 million acres (96 percent) will be subject to excess water hazards. By 2020 the agricultural land base will be 5.98 million acres with an estimated 97 percent subject to problems of excess water. Based on present trends in establishing works of improvements through going programs and projects evaluated as being feasible under projected future needs, it is estimated that 37 percent of the land in agricultural use will have treatment applied to reduce all hazards.

Projections for future use (2020) indicate that fresh water surface acreage will remain about the same since natural impoundment areas are very limited. There will be a shift of 1950 square miles of land from agriculture to non-agriculture.

By 2020, agricultural water use will be approximately 1.7 times the amount used in 1968 or 3.57 million acre-feet per year. Daily water use for rural household, livestock, rural lawns and gardens, spraying and golf courses will amount to 251 million gallons per day or about 0.28 million acre-feet per year. Water needs for irrigation will amount to approximately 3.29 million acre-feet annually.

The 5.98 million acres of land projected to be available without proposed project development for agricultural use by 2020 includes 351,400 acres citrus, 623,200 acres of other crops which includes 300,900 acres of vegetables and 314,300 acres of sugarcane, 1.5 million acres of improved pasture, 580,000 acres of native range, 1.5 million acres of forestland, and 1.4 million acres in miscellaneous agricultural uses.

With the development of water and related land resources, net returns from agricultural and forest products will rise. In 1968, income from agricultural production was an estimated $405.6 million while forestland owners received $0.7 million in stumpage payments. Basin agricultural production should approach a value of $1.06 billion with stumpage values of harvested wood products reaching about $9.0 million by 2020.

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The total agricultural land area is expected to decrease by 1,248,000 acres (1950 sq. mi.) by 2020. This reduction in land available for agricultural production and the hazards and limitations associated with the use of the soils resources indicate the need for resource development.

Flood prevention and agricultural water management works of improvement evaluated in terms of immediate needs (1980) indicate that 15 planning units, out of the 126 in the Basin, are feasible. Six are considered marginal and 97 not feasible. Eight planning units which have P.L. 566 watershed plans are not included in the above figures of feasible projects. There are 15 active P.L. 566 applications in the Basin, of which 8 have been planned covering 272,000 acres and 6 of these have been completed. The remaining 7 applications are awaiting planning and/or construction and cover 206,000 acres. The 15 active P.L. 566 applications cover completely 12 of the 126 planning units in the Basin and parts of 4 other planning units.

Total annual cost of the 21 planning units found to be feasible or marginal would be $6.3 million. Agricultural benefits from works of improvements for these units would amount to $8.4 million on 1.4 million acres of citrus, vegetables, sugarcane, and improved pasture. Benefits would also accrue to residential, commercial, and other non-agricultural areas due to reduction of water hazards.

The potential for agricultural development to meet future needs (2020) was evaluated on the basis that works of improvement would be designed and installed with sufficient capacity to give the desired protection for the projected use of the soil resources. This evaluation indicated that 33 additional units found not to be feasible or marginal in 1980 would have Benefit-to-Cost ratios of 1 to 1 or better by 2020. Total annual cost of the 33 units would be $5.04 million. Benefits from works of improvements are estimated to be $7.68 million involving 2.29 million acres of land and water. Of the remaining 64 planning units found to be not feasible in 1980 or 2020, six were water storage areas including the conservation areas, Lake Okeechobee and the Everglades National Park. Fifteen units were almost completely dominated by urban areas and 20 units have very small amounts of agricultural improvements and were mostly open wildlife areas, forestland, and native range. This preliminary analysis indicated that 23 units involving moderate amounts of agricultural improvements would remain not feasible for project action by 2020.

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USDA REPORT ON USE AND DEVELOPMENT OF LAND AND WATER RESOURCES

KISSIMMEE-EVERGLADES AREA, FLORIDA

I N T R O D U C T I O N

The Florida Department of Natural Resources, Division of Interior Resources, Bureau of Water Resources, is making an inventory of the State's land and water resource by river basins. This information will serve as a basis of recommendations for planning and administering the physical aspects of development and management of these resources.

The Director of the Department of Natural Resources has been authorized to prepare a report on water and related land resources availability and use in the Kissimmee-Everglades Area. The Director requested the assistance of the USDA in making investigations and preparing a companion report to the State's Report. This companion report, or USDA Report emphasizes the agricultural phases of the water and related land resources of the Kissimmee-Everglades Area. The State's Report will present more detailed data relative to availability and need for water resources for non-agricultural purposes.

The U. S. Department of Agriculture is authorized to cooperate with the State under Section VI of Public Law 566 (River Basin Planning Section of the Small Watershed Act). The U.S.D.A. activities in the study are under the leadership of the U. S. Soil Conservation Service in cooperation with the Economic Research Service and the U. S. Forest Service.

The primary objective of the U.S.D.A. in participating in this study is to facilitate the coordinated and orderly conservation, development, utilization and management of the water and related land resources of the Basin. In carrying out this objective, due consideration is given to the projected land and water resource needs of an expanding population, and the physical and economic aspects of flood prevention and control; watershed protection, drainage and irrigation, surface and subsurface water supply, water quality control; fish and wildlife resources; environmental protection and enhancement; and other related matters.

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The State has been divided into five major hydrologic areas and inventories are being made by these major drainage areas or river basin groups. The data is being used to develop a comprehensive report for each basin or groups of basins. This is the third USDA report. The first report was the Florida West Coast Tributaries, published in 1966 and the second report was the St. Johns River Basin and Intervening Coastal Areas, published in 1970. When the basic studies are completed statewide, USDA is expected to work with state agencies in further investigations, analyses, and formulation of a statewide plan or plans.

The Kissimmee-Everglades Area report consists of the main report, and an appendix. The appendix is a summary of techniques, procedures and definitions used in developing data contained in the main report and some detailed soils information. The appendix contains information on individual planning units including some Watershed Investigation Reports for those units needing project action within the next 10 to 15 years.

Secondary data sources were utilized throughout this report. The sources of data are generally listed in each section. A complete bibliography is presented at the end of this report. The base year used in the report is 1968. In cases where data for 1968 was not available, the most recent year available was used. Seven counties are only partially within the hydrologic boundaries. Data for these counties were adjusted to reflect the portion within the Basin. Dollar values are based on either 1968 prices adjusted on the basis of the Consumer Price Index for all items, or adjusted normalized prices.

Information contained in the USDA report will be useful to individuals, planning councils, water management districts and governmental agencies involved in planning and implementing programs that will bring about optimum use of the State's land and water resources. Planners can avoid conflicts by considering the data and information presented.

Other agencies giving consultive services or furnishing reports to the Director of the Department of Natural Resources in addition to the U.S.D.A., are U. S. Department of Interior, Geological Survey; U. S. Army Corps of Engineers; Central and Southern Florida Flood Control District, and all of the departments, divisions and bureaus of the State Government having responsibilities in soil and water resources.

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Acknowledgement is made of the cooperation received from the University of Florida, Florida Extension Service, Soil and Water Conservation Districts, Agricultural Stabilization and Conservation Service, Farmers Home Administration, County Commissioners, county and city planning organizations and regional planning councils, and others who have aided in the collection and development of the data used in this report. Appreciation is extended to the East Central Florida Regional Planning Council as well as the South Florida Everglades Area Planning Council for their effort in publicizing and distributing this report.

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S E C T I O N I

NATURAL RESOURCES OF THE BASIN

Description of the Basin

The Kissimmee-Everglades Area consists of the southern part of the peninsula of Florida including the Florida Keys (Figure 1). The northern boundary is formed by the divide between the Kissimmee River Basin and the St. Johns River Basin on the northeast and the Peace River Basin on the northwest. The Kissimmee River originates near Orlando and flows almost due south into Lake Okeechobee. This is in contrast to the St. Johns River which is less than 50 miles east and flows almost due north. The 17,664 square mile area includes all of the southern peninsula of Florida that was not included in either the Florida West Coast Tributaries Report or the St. Johns River Basin and Intervening Coastal Area Report. The area is made up of 15,702 square miles of land and 1,962 square miles of water. The water area consists of 1,076 square miles of fresh water lakes and streams, and 886 square miles of salt or brackish estuaries and rivers.

All or parts of seventeen counties are within the boundaries of the Basin. For watershed planning purposes, the area was divided into 126 planning units ranging in size from 13 to 1,769 square miles.

Climate and Rainfall

The climate of the Basin is subtropical, varying from a mean annual of 72.5 degrees at Orlando to 75.7 degrees at Miami (Figure 2). Many of the Keys have never experienced freezing temperatures. During the winter months, the temperature in the northern part of the Basin averages approximately 10 degrees cooler than in the southern part of the Basin. The temperature is fairly uniform over the Basin during the summer months. The area is popular for winter tourists because of the warm climate and sunny skies. Almost 70 percent of the maximum possible sunshine during the winter months is available without cloud cover. This percentage is far higher than for any other area east of the Mississippi River. Many winters - sometimes several in succession - pass without frost or freezing in southern Florida.

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Rainfall over the Basin varies both seasonally and by location. Average rainfall varies from 40 inches at Key West to over 64 inches in the area approximately 20 miles inland from the lower east coast (Figure 3). Except for these extremes along the lower east coast and the Keys, the remainder of the area has a fairly uniform average annual rainfall of approximately 52 inches. In general, over 60 percent of the average annual rainfall occurs during the four months of June, July, August and September (Figure 4). The lower east coast is subject to more hurricanes than any other area in the United States. Key West and Miami can expect hurricane force winds on an average of one in seven years and these storms often are accompanied by copious rainfall.

Growing Season

The average growing season, or period between the last killing frost in spring and the first in fall varies from about 300 days in the vicinity of Orlando to 365 in the area around Homestead. Lake Okeechobee helps to moderate the cold damage for the area south and east of the Lake. This area is famous for the production of winter vegetables and sugarcane. Because of the favorable climate during the winter season, this area has an advantage over the rest of the nation for growing vegetables. A large portion of the national market for winter vegetables is supplied by the Lake Okeechobee Area.

Physiography

Topography

The Basin consists mainly of low, nearly level plains. Approximately two-thirds of the area has an elevation of twenty feet or less (Figure 5). The only area over 100 feet above sea level is in the northwest where there is a ridge of rolling hills that extends from Orange County to the southern edge of Highlands County. The highest natural ground elevation in the Basin is slightly over 300 feet, south of Lake Wales. The southwestern part of the Basin comprises the Everglades and is a unique area of low flat swamps interspersed with brackish streams and countless islands. A portion of this area has been set aside as a national park in order to preserve it in its natural state.

Geology

The geologic formations of the Basin are entirely sedimentary. The basal formations are thick, highly calcareous sediments of the Eocene Age. The uppermost of these is the Ocala Formation,

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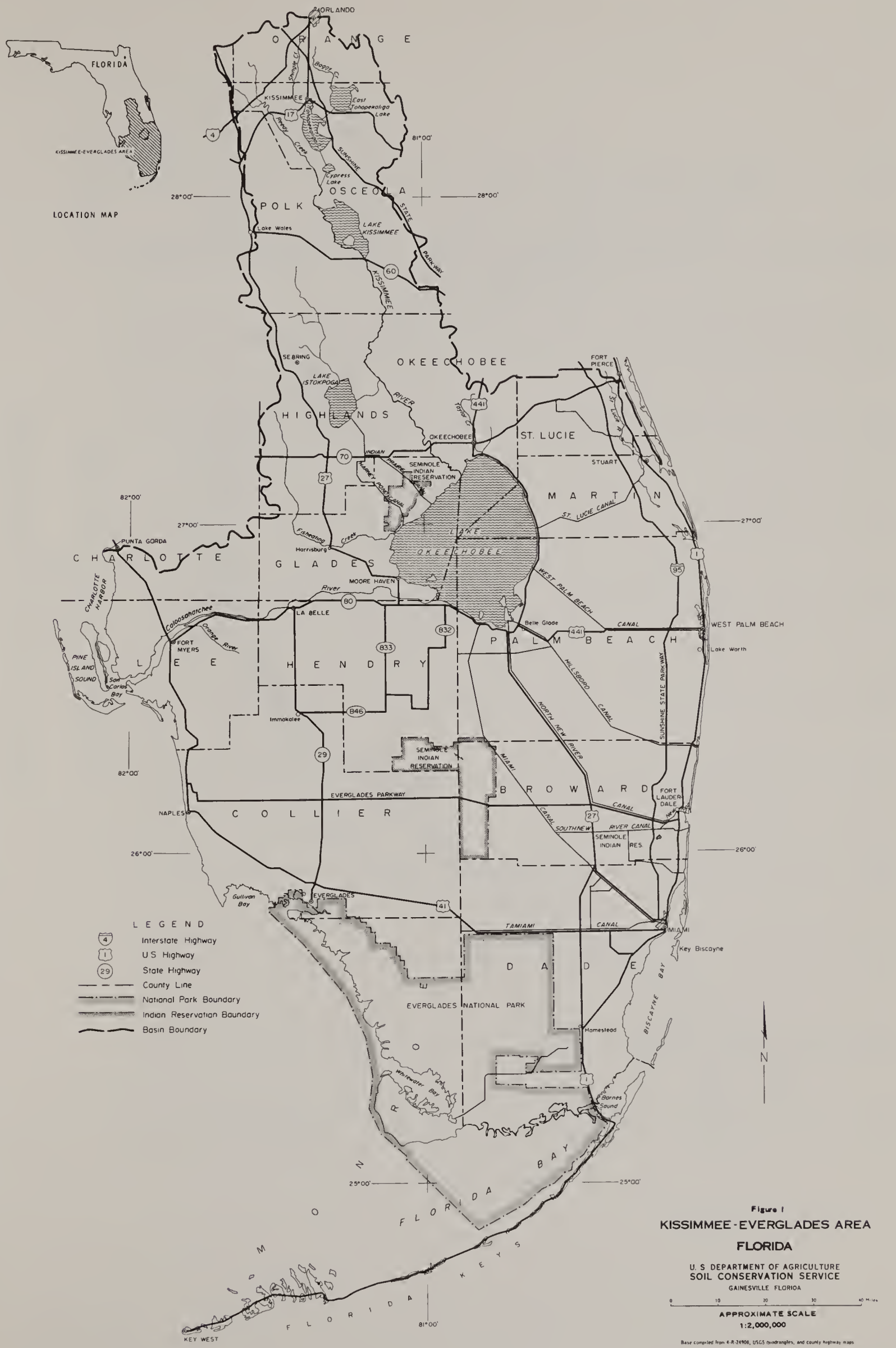


Figure 1

KISSIMMEE-EVERGLADES AREA

FLORIDA

U. S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
GAINESVILLE FLORIDA

0 10 20 30 40 Miles

APPROXIMATE SCALE
1:2,000,000

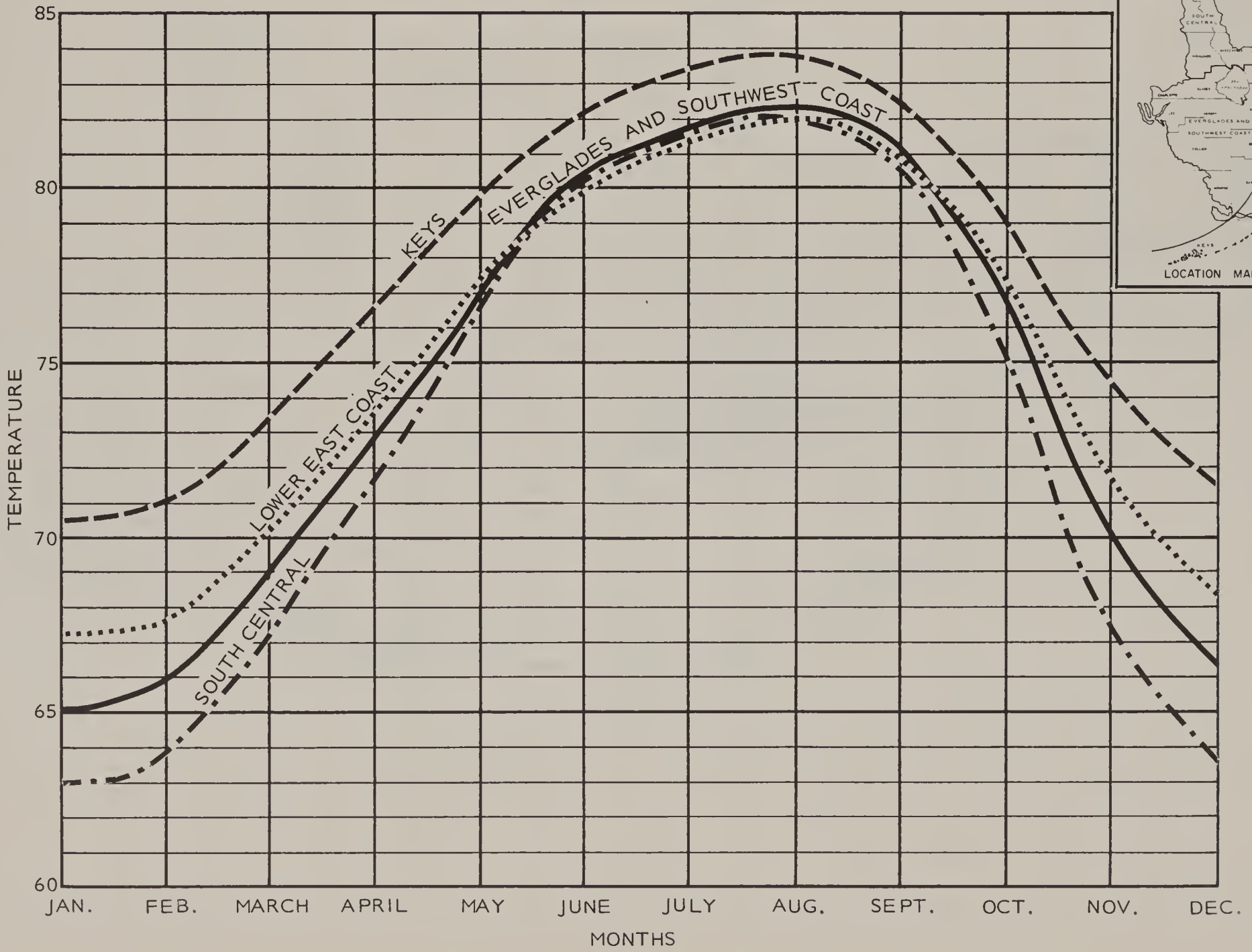
Base compiled from 4-R-24908, USGS quadrangles, and county highway maps
All planimetric detail taken from these sources

May 1971

4-R-24908-A

Figure 2

AVERAGE MONTHLY TEMPERATURE
1931–1960
KISSIMMEE–EVERGLADES AREA



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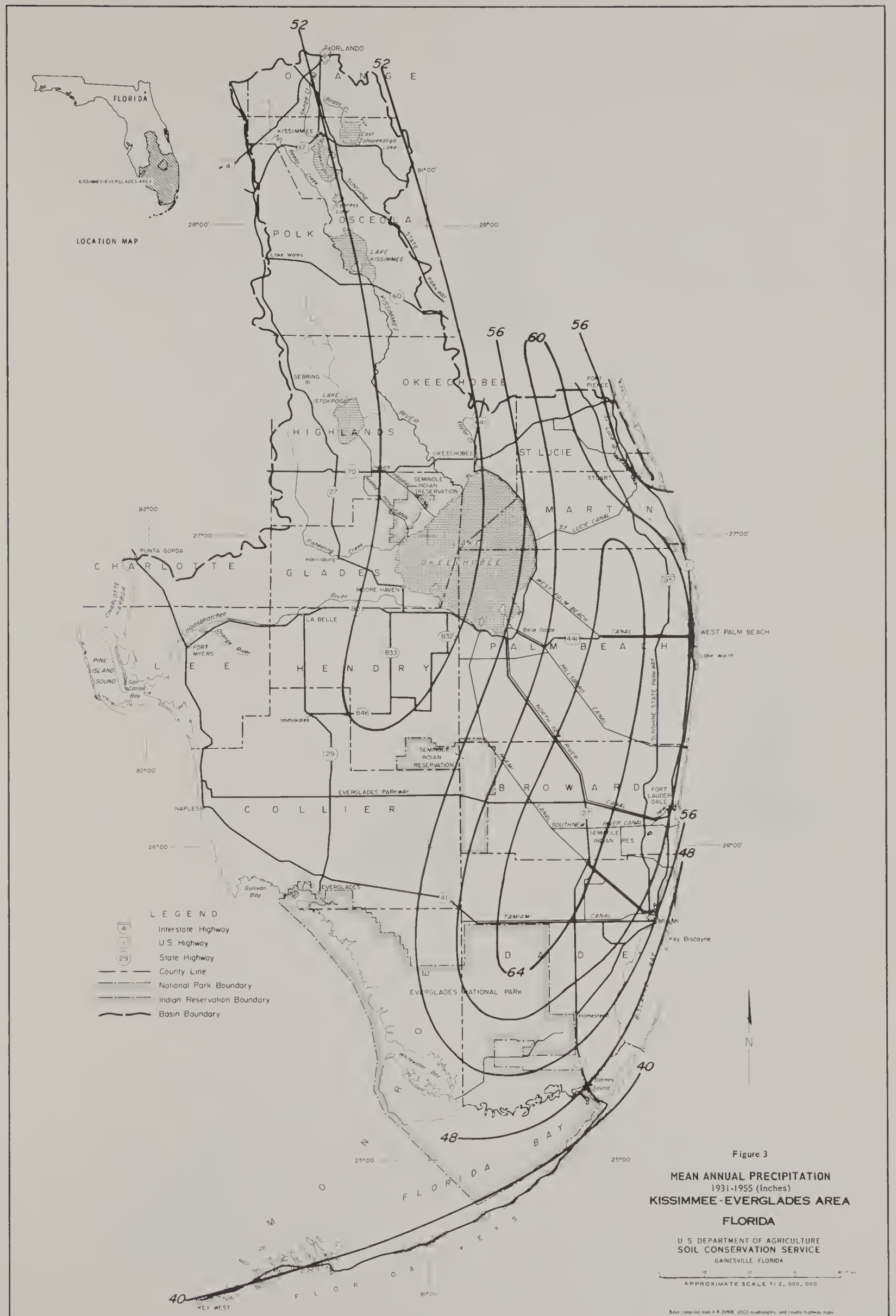


Figure 3

MEAN ANNUAL PRECIPITATION
1931-1955 (Inches)
KISSIMMEE-EVERGLADES AREA
FLORIDA

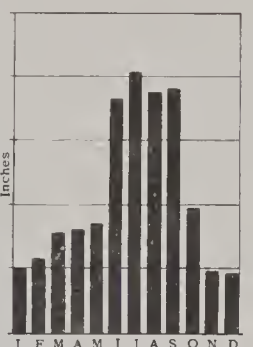
U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
GAINESVILLE FLORIDA

APPROXIMATE SCALE 1: 2, 000, 000

Base compiled from 4 R 24908 USGS quadrangles and county highway maps
All planimetric detail taken from these sources

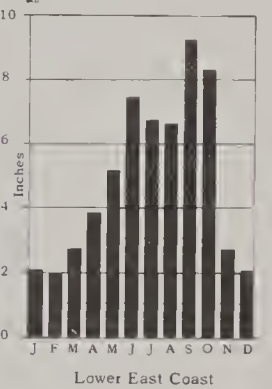
5-71 4-R-30424

LOCATION MAP

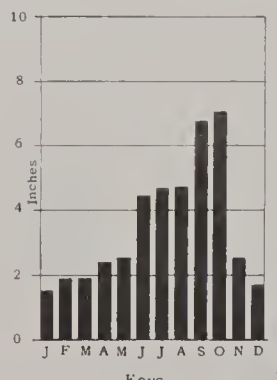


South Central

Everglades and S. W. Coast



Lower East Coast



Keys

LEGEND

- Interstate Highway
- U.S. Highway
- State Highway
- County Line
- National Park Boundary
- Indian Reservation Boundary
- Basin Boundary

Figure 4

NORMAL RAINFALL BY MONTHS
1931–1960
KISSIMMEE-EVERGLADES AREA
FLORIDA

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
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APPROXIMATE SCALE 1: 2, 000, 000

Base compiled from 4 R 24908, USGS quadrangles and county highway maps
All planimetric detail taken from these sources

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May 1971

4 R 24908-A

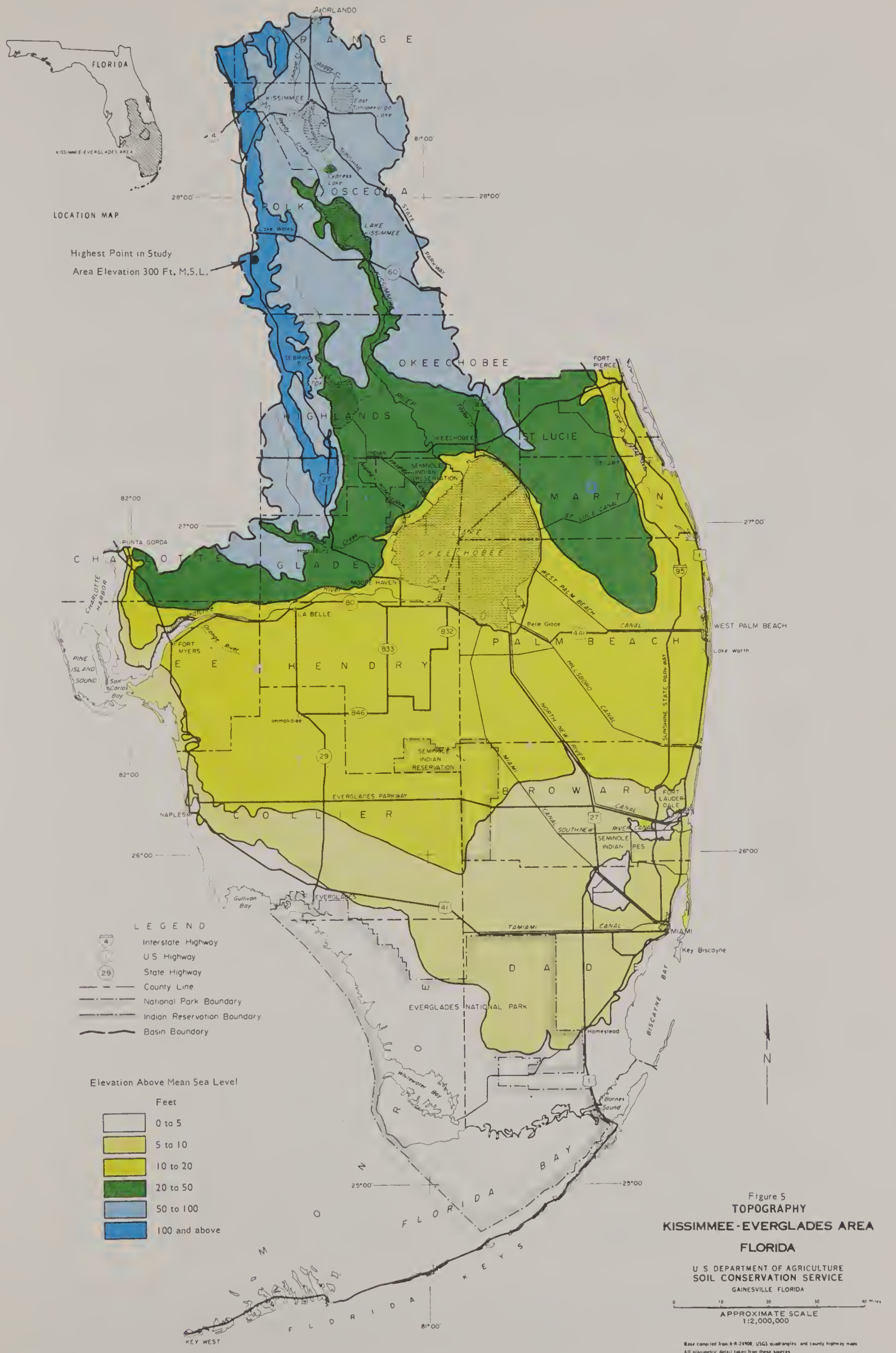

Figure 5
TOPOGRAPHY
KISSIMMEE-EVERGLADES AREA
FLORIDA

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
GAINESVILLE FLORIDA

APPROXIMATE SCALE
1:2,000,000

Base compiled from 4-R-24908, USGS quadrangles and county highway maps
All planimetric detail taken from these sources

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May 1971
4-R-24908-A

a cavernous limestone that is an important water-bearing stratum. The upper surface of the Ocala Formation varies from sea level in Orange County to 1200 feet below sea level in Dade County.

Successive periods of sedimentation and erosion during Oligocene, Miocene and Pliocene ages have left discontinuous strata of inter-bedded limestone, marl and unconsolidated sands and clays. The Hawthorn Formation of the Miocene Age is the most important Strata. This formation is relatively impervious in most locations and forms a seal over the underlying limestone making possible the storage of large quantities of fresh water in the limestone caverns.

During the interglacial ages, the sea repeatedly flooded southern Florida forming marine terraces. Three of these terraces and their approximate shoreline elevations are the Wicomico, 100 feet; Pamlico, 25 feet; and Silver Bluff, 8-10 feet.

The geologic strata and their inter-relationship have greatly influenced development of physiographic features of the Basin and the kinds of soils to be found in it. This in turn has affected the potentials of different areas for various uses. The kinds of soils are directly related to the geological materials exposed or very near the surface.1/

Water Resources

The Basin has vast quantities of fresh water available in both underground aquifers and in its lakes and streams. This water is not evenly distributed over the area and varies in quality throughout the year. There is one large area in the Basin with very little fresh water available either in surface sources or in the ground water supply. This area begins near the southern edge of Lake Okeechobee and extends in southwesterly direction to the lower west coast in the Everglades National Park. There is a limited supply of fresh water available in the shallow aquifer but this source is very limited and could not meet heavy demands such as large irrigated acreages.

The Kissimmee River and the Caloosahatchee River are the only natural rivers which make a major contribution toward meeting the area's fresh water needs. There are many creeks that drain relatively large areas and are of considerable importance in meeting the local drainage and water needs. Some of these creeks are Taylor, Fisheating, Arbuckle, Reedy, Shingle, and Boggy. There is a complex network of constructed canals in the area south and east of Lake Okeechobee with water control structures that normally store large quantities of water and serve as outlets for floodwater during wet seasons.

1/ For a more complete geological description of the Basin, refer to report "Water and Related Land Resources, Kissimmee-Everglades Area", Florida Department of Natural Resources.

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Lake Okeechobee with over 700 square miles of surface area is by far the largest lake in the Basin and is the second largest fresh water lake entirely within the United States. This lake is to be regulated by opening and closing structures on various outlet canals on an operating schedule of 15.5 to 17.5 feet (MSL). The stored water is used to irrigate farmland, supply the Everglades National Park, recharge the Biscayne Aquifer in Broward and Dade Counties and to recharge the shallow aquifer in the Lee County area of the west coast. A recent study by the U.S. Geological Survey of Lake Okeechobee found the chemical and physical qualities of the water generally meet the criteria established by the State of Florida for drinking water.1/

Some of the larger lakes are listed in Table 1-1, along with the surface area of each. In general, the quality of the water in all of these lakes is excellent for irrigation of agricultural crops.

TABLE 1-1. Surface area of the larger lakes in Kissimmee-Everglades Area

Lake	Surface Area (sq.mi.)2/
Okeechobee	717
Kissimmee	47
Istokpoga	42
Tohopekaliga	26
East Tohopekaliga	16
Weohyakapka	11
Hatchineha	10

There are numerous smaller lakes scattered throughout the Kissimmee Valley that have considerable storage capacity. There is very limited local agricultural demand for the water in many of these lakes at the present time, but some could be diked to allow additional storage as the need arises. Of the larger lakes only Lake Istokpoga and Lake Okeechobee are of major importance in supplying the agricultural water needs of the Basin.

1/ Florida Conservation News; October 1971

2/ Measured from Aerial Photographs (Scale 1:20,000)

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The underground aquifers of South Florida are among the most productive found anywhere in the United States, but they are not all of suitable quality or of adequate capacity. The Floridan Aquifer is the principal source of water for the Basin north of Lake Okeechobee but south of the lake the water becomes too highly mineralized for most uses. The recharge area for the Floridan Aquifer within the Basin is generally limited to the sand ridges along the northwestern boundary. The quality of water in this Aquifer is generally suitable for most uses near the area of recharge, but tends to become highly mineralized further away from the recharge areas and at greater depths in the Aquifer. Even in areas where this artesian aquifer is of good quality, there may not always be sufficient volume to meet all demands due to inadequate recharge.

The Biscayne Aquifer is a nonartesian aquifer that underlies most of Dade and Broward counties. Most of the recharge for this aquifer comes from local rainfall or from the conservation areas. There is no natural underground barrier along the coast to prevent salt water from moving inland whenever the water level in the aquifer is lowered below sea level. Since this is the principal source of water for the populous lower east coast, the recharge area should remain in a land use that will allow recharge and also the groundwater table should be held as high as possible to prevent salt water intrusion. Already salt water has moved inland several miles in the vicinity of Miami. In many areas, this trend has been reversed since the installation of salinity control structures in the outfall canals.

The surface water supply for south Florida depends to a large extent on the storage in Lake Okeechobee. This lake stores the runoff from the Kissimmee River, Taylor Creek, Fisheating Creek and other drainage areas having a combined area of over 2.5 million acres. The average annual runoff from this drainage area is approximately 10 inches per year which amounts to over 2 million acre-feet of fresh water. This runoff is stored in Lake Okeechobee until needed if storage capacity is available in the lake. The average annual rainfall of 53 inches (Figure 3) on Lake Okeechobee is approximately equal to the evaporation from the surface of the lake; therefore this rainfall cannot generally be depended upon to help supply the Basin's water needs. The authorized project to raise the dikes around Lake Okeechobee for an operating range from 15.5 to 17.5 feet is nearing completion. This would permit additional storage for the years with above average runoff and would allow a much larger carryover to help meet the water needs for years with below normal runoff.

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The records of runoff for the area south of Lake Okeechobee are not as accurate as for the Kissimmee Basin, but generally the runoff is considerably less than 10 inches per year. The only provision for storing this runoff is to pump it into the conservation areas or back pump it into Lake Okeechobee.

The Everglades National Park has requested a firm commitment of 315,000 acre-feet of water each year and any additional water whenever available. This is approximately one-seventh of the average annual water available from Lake Okeechobee and in a dry year such as 1962, represents the total water available from the lake. The need for maximum storage in Lake Okeechobee thus becomes apparent when the large demands for water by agriculture, municipalities, and industry are added to the requirements for the Park.

Major Land Resource Areas

The Basin is comprised of portions of three Major Land Resource Areas.[1/] The three Resource Areas are: 154 - South Central Florida Ridge; 155 - Southern Florida Flatwoods, and 156 - Florida Everglades and Associated Areas (Figure 6). Each of these Resource Areas has a unique physiography, as indicated in the following descriptions.

South Central Florida Ridge (154). This is an area of well-drained sandy uplands. The terrain is mostly undulating to rolling well-drained sand hills with medium and small sized deep lakes and shallow ponds. There is no definite stream pattern in most places and drainage is principally into the thick sandy soils. Some lakes are connected by drainageways. Elevations range from about 300 feet on the highest hills to about 70 feet on the lowest lakes. The soils are mostly deep, droughty sands. There are small areas of wet soils adjacent to some lakes and in depressions.

Southern Florida Flatwoods (155). This is an area of nearly level land that is generally 50 to 100 feet above sea level in Polk, Orange, and Osceola counties. Land elevations are less than 50 feet (MSL) south of these counties. The terrain is predominately wide, low nearly level flatlands and numerous small, medium and large swamps. Surface water moves sluggishly through a system of poorly defined channels and swamps. Groundwater is near the surface over much of the area and most soils are influenced by the water table. The swamps are perennially wet. A few small ridges of well-drained soils are included. The area also includes coastal beaches and associated sand dunes and sand ridges.

1/"Land Resource Regions and Major Land Resource Areas of the United States", Agriculture Handbook 296, USDA-SCS, December 1965

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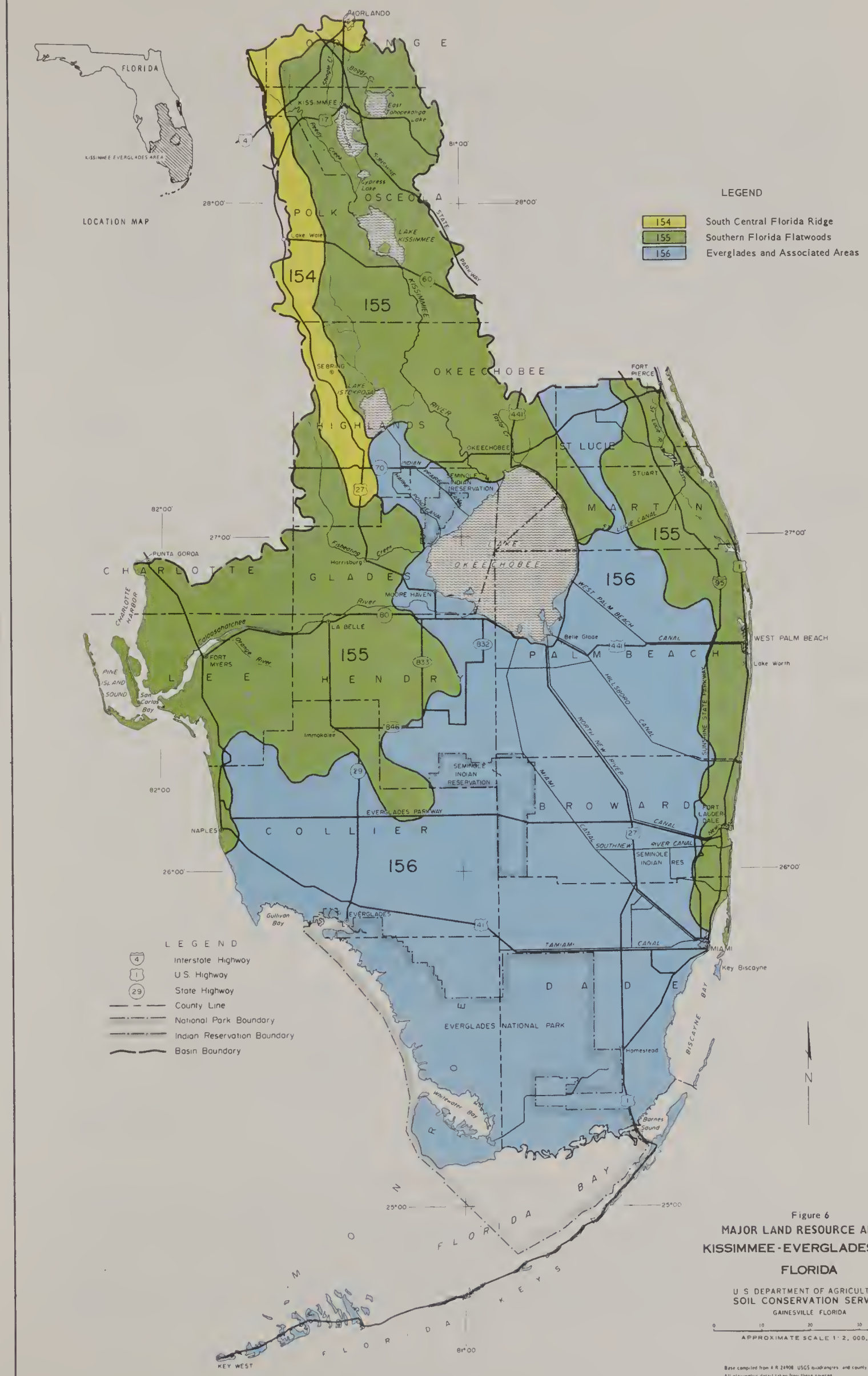

Figure 6

MAJOR LAND RESOURCE AREAS

KISSIMMEE-EVERGLADES AREA

FLORIDA

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
GAINESVILLE FLORIDA

APPROXIMATE SCALE 1:2,000,000

Base compiled from 4 R 24908 USGS quadrangles and county highway maps
All planimetric detail taken from these sources

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May 1971

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Florida Everglades and Associated Areas (156). This is an area of low-lying land that covers the extreme tip of the Florida peninsula. It includes the Everglades, an expanse of grassy wetland; large cypress hardwood swamps; nearly level open land with shallow limestone soils studded with slightly elevated pine island and palm hammocks; mangrove swamps; and the Keys off the southern tip of the State. Elevations range from 0 to 25 feet above sea level. The Everglades and much of the rest of the area are perennially wet and subject to frequent flooding. Soils range from deep peats and mucks of the Everglades to shallow, rocky soils. A few places have deep, wet sandy soils.

Soils

The soils of the Basin range from deep, excessively drained sandy soils on the ridges to very poorly drained organic soils in the Everglades. Some are shallow sands over limestone; some have loamy or clayey subsoils near the surface. Others have clean sandy horizons extending to great depths. Many are strongly affected by groundwater that fluctuates near the surface. Forty-five soil series and six unclassified soil units of significance to the study were recognized in the Basin (Appendix).

Some of the soils are well suited to a wide variety of uses without special treatment. Others have severe limitations and require intensive treatment and management when used for any purpose. All land use and management programs must ultimately deal with this diversity of soil conditions. Soils information that tells the limitation the soil has for some specific uses is indispensable to this study.

The soils have been mapped in detail over much of the Basin. Soil surveys have beem completed for Highlands, Orange, and Okeechobee counties. Surveys of Palm Beach, Broward, and Osceola counties are well under way, and surveys of many large and small tracts have been made in all other counties. There are also detailed reconnaissance surveys of Dade and Collier counties and the Everglades Drainage District. These surveys provide a basis for making a reasonably accurate estimate of the location and extent of the most significant kinds of soils, (Appendix).

A general soil map of the Basin is shown in Figure 7. The delineations on this map show important soil associations. Each soil association represents a group of several different kinds of soils that occur together in distinctive and repeating patterns. With a knowledge of the relative proportion of important soils in the associations and the area covered by

each, it is possible to make reliable estimates of the amount of each soil in a planning unit. General Soils Maps are intended for general planning purposes. Each delineation may contain soils having ratings different from shown on the map.

The many different kinds of soils can be grouped into a relatively few groups such as land capability classifications for various kinds of interpretations. Interpretations based on limitations, restrictions or hazards due to physical properties of the soil are used for non-agricultural purposes.

Interpretations for Agricultural Uses. Land capability classification is one of a number of interpretive groupings made primarily for agricultural uses.[1/] This classification is done on the basis of the soils capability to produce common cultivated crops and pasture plants without deterioration over a long period of time. To express suitability of soils for range and woodland uses, the soils are grouped into range sites and woodland suitability groups. They range from Class I soils that have no important limitations to Class VIII soils with very little agricultural capability. The capability classes defined briefly are:

Class I - Soils have few limitations that restrict their use.

Class II - Soils have some limitations that reduce the choice of plants or require moderate conservation practices.

Class III - Soils have severe limitations that reduce the choice of plants or require special conservation practices, or both.

Class IV - Soils have very severe limitations that restrict the choice of plants and require very careful management.

Class V - Soils have little or no erosion hazard but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife food and cover.

Class VI - Soils have severe limitations that make them generally unsuited for cultivation and limit their use largely to pasture or range, woodland, or wildlife food and cover.

Class VII - Soils have very severe limitations that make them unsuited for cultivation and that restrict their use largely to grazing, woodland or wildlife.

1/ "Land Capability Classification - Agriculture Handbook No. 210, USDA - Soil Conservation Service, September 1961".

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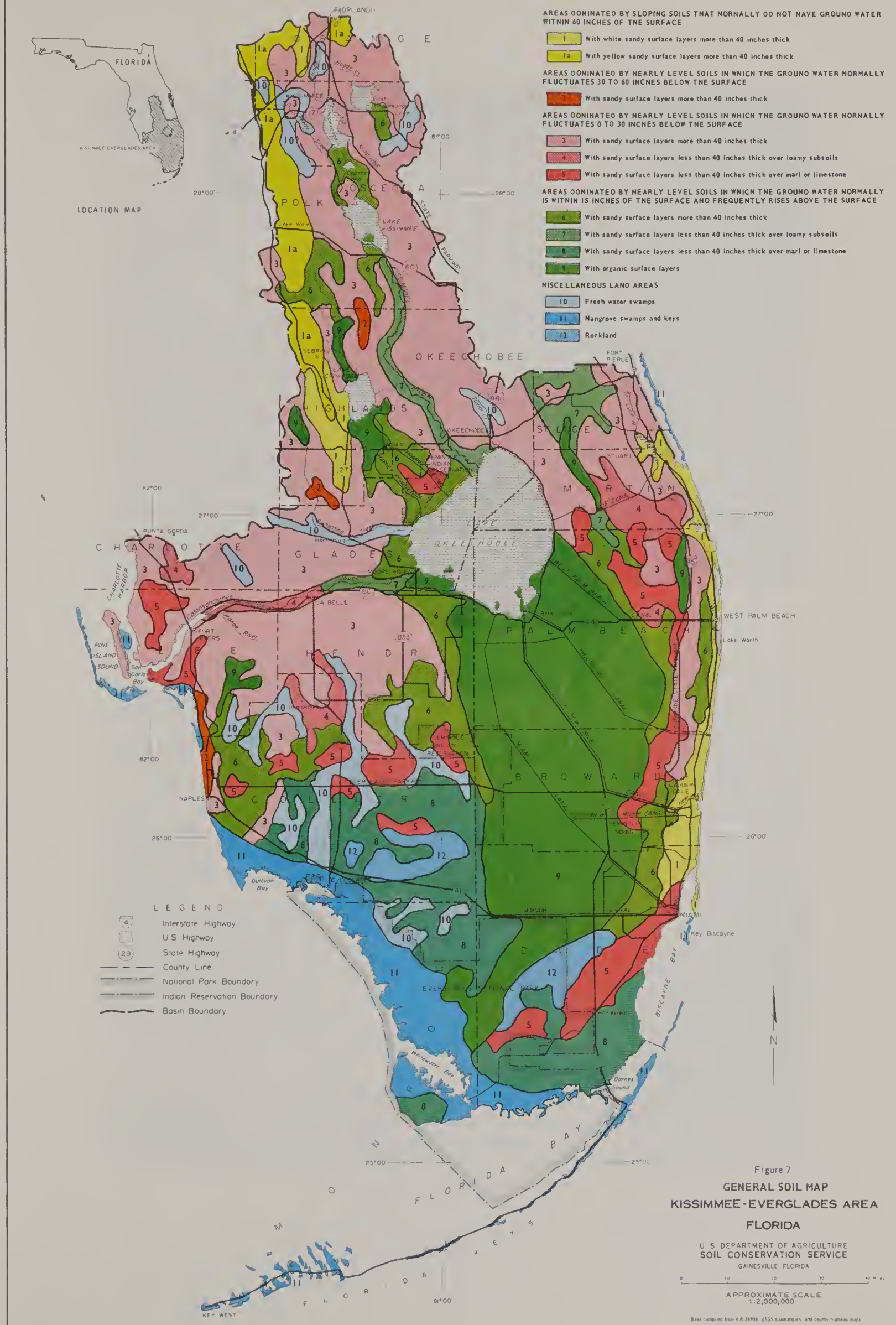

May 1971

4-R-24908-A

THE EVERGLADES

Photos courtesy Central and South Florida Flood Control District

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Class VIII - Soils and land forms in this class will have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife, water supply, or aesthetic purposes.

Subclasses are groups of capability units within classes that have the same kinds of dominant limitations for agricultural use. Some soils are subject to erosion if they are not protected, while others are naturally wet and must be drained if crops are to be grown. Some soils are shallow or droughty, or have other soil deficiencies. The three kinds of limitations recognized at the subclass level are: Risks of erosion, designated by the symbol (e); wetness, poor drainage, or overflow (w); and root-zone limitations (s).

With information about location and extent of different kinds of soils, the capability grouping makes it possible to appraise the quality of the soil resources for any part of the Basin, and the treatment needed to sustain or improve them. Many of the natural limitations or hazards can be corrected or overcome by proper treatment and management.

The approximate amounts of land by capability classes and subclasses in the Basin are:

Class or Subclass	Acres	Percent
I	0	0
IIs	0	0
IIw	500	0
IIIs	205,200	2.0
IIIw	1,950,200	19.4
IVs	41,400	0.4
IVw	3,670,600	36.5
Vw	1,522,900	15.2
VIs	27,700	0.3
VIw	665,900	6.6
VIIs	94,600	1.0
VIIw	1,359,800	13.5
VIIIw	221,100	2.2
Unclassified	289,800	2.9
Total Land	10,049,700	100.0

In addition to these classifications, soils were grouped according to similarity of productivity and production practices in order to determine acreage needed to achieve the projected production of agricultural commodities and to determine impacts of project proposals. (Appendix). The most common soils associated with forestland were grouped according to their capabilities and limitations for growing pine (Appendix).

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Interpretations for Other Uses. Interpretations for non-agricultural uses are not covered by the Land Capability Classification. However, the same basic properties of the soil that affect its capability for growing crops also affect its ability to support the weight of buildings, absorb septic tank effluent, or almost any other use of the soil. The grouping of soils for non-agricultural uses is made in terms of limitations, restrictions or hazards for specific uses. These are expressed as slight, moderate, severe and very severe. These interpretations indicate the natural limitations imposed by the soil for the proposed use and point up the kind and intensity of treatment needed to overcome these shortcomings. They have an important bearing of the suitability of land for different uses. Brief definitions of the four classes are:

Slight: The soil is well adapted for the proposed use and has few if any limitations, restrictions or hazards that would interfere with the proposed use.

Moderate: The soil has moderate limitations, restrictions or hazards for the proposed use, but these can be easily corrected.

Severe: The soil has serious limitations, restrictions or hazards for the proposed use, and requires intensive corrective management if it is to be so used.

Very Severe: These soils cannot support the proposed use. The physical nature of the soil must be completely altered or the soil material removed and replaced by more suitable materials.

Some of the most important soil properties affecting these interpretations are: wetness, flood hazard, texture and consistence of different layers, depth to rock, permeability, traffic supporting capacity, load supporting capacity, shrink-swell potential, slope, and erodability. Some of these such as wetness, affect all uses. Others such as traffic supporting capacity, affect only one or two. Soils with excess water are placed in "w" subclasses. Those without wetness limitations but which have some other soil related limitation are placed in an "S" subclass. The interpretations are based on a weighted evaluation of all significant properties. Low ratings for some soils are based on only one outstanding limiting property; others are limited by several unfavorable properties that must be considered in giving a proper rating.

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For this report, seven general non-agricultural uses are considered. The effect of soils on other uses can readily be estimated by determining the soil properties that are significant to the use and relating these to the known physical developments, highways, septic tanks, sanitary landfills, graded roads, recreation areas and light industry. Figures 8, 9, 10 and 11 are general soil maps that show suitability for the seven uses based on the degree of limitations, restrictions or hazards of the dominant soils.

Fish and Wildlife Resources

The lakes furnish some of the finest fishing in Florida, especially for large mouth bass, bluegill, black crappie, and redear sunfish. Lake Okeechobee supports a valuable commercial fishery for catfish and an excellent sport fishery for largemouth bass and other species. The coastal marshes and mangrove swamps are productive areas upon which a large majority of the sport and commercial species of fish and shellfish depend for part or all of their life cycle.

The water conservation areas abound with bird and animal life and the canals and marshes provide good fresh-water fishing. More than 150 species of birds can be seen in the conservation areas, including various waterfowl, woodstorks, egrets, herons, bald eagles, wild turkeys plus scores of songbirds. Animal life includes the rare Florida panther and black bear as well as deer, wild hog, otter, raccoon, and bobcat. Areas of rangeland, open woods, and improved pasture throughout the Basin also provide a habitat for many birds and animals.

The rare or endangered species of birds, fish and animals that are known to live in the Basin are:

1. Florida Panther
2. Key Deer
3. Florida Manatee
4. Brown Pelican
5. Florida Everglades Kite
6. Florida Great White Heron
7. Red Cockaded Woodpecker
8. Cape Sable Sparrow
9. Southern Bald Eagle
10. Greater Sandhill Crane
11. Florida Sandhill Crane
12. American Alligator
13. American Crocodile
14. Shortnose Sturgeon

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Quality of the Natural Environment

Scenic Beauty

The native vegetation, beaches, lakes and streams afford a variety of beauty in urban settings and on undeveloped land. The vegetation is subtropical, including palms, perennial shrubs and ornamentals. Pine, oak, and cypress occur over much of the area becoming more prominent in the northern counties. Tropical fruits such as mangos, avacados, and guavas are common in the southern counties. The Keys support a number of subtropical trees not found elsewhere in the United States, the vegetation being closely allied to that of Cuba and the Bahama Islands.

In the Everglades and Big Cypress Swamp there are large undeveloped areas that remain very much in their original state. The Everglades are unique to this part of Florida and afford an unusual type of beauty. Wild life and birds are attracted to these vast flat areas of sawgrass with clusters of trees (hammocks) that form islands of dense vegetation. The Big Cypress Swamp includes thick forests of cypress and mixed hardwoods on wet areas having the better soils (strands) and nearby treeless grass-sedge wet prairies. On these wet areas the vegetation is greatly influenced by slight changes in ground elevation. Mixtures of pine, palm and saw-palmetto grow on the drier areas. The change from cypress predominance to saw-grass marks the boundary between the Big Cypress and the Everglades.

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LOCATION MAP

LEGEND

- Slight
- Moderate
- Severe
- Very Severe

LEGEND

- Interstate Highway
- U.S. Highway
- State Highway
- County Line
- National Park Boundary
- Indian Reservation Boundary
- Basin Boundary

Figure 8

DEGREE OF LIMITATIONS, RESTRICTIONS, OR HAZARDS OF PRINCIPAL SOILS FOR HIGHWAYS

KISSIMMEE-EVERGLADES AREA

FLORIDA

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
GAINESVILLE FLORIDA

APPROXIMATE SCALE
1:2,000,000

Base compiled from 4 R-2490B USGS quadrangles, and county highway maps
All planimetric detail taken from these sources

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May 1971

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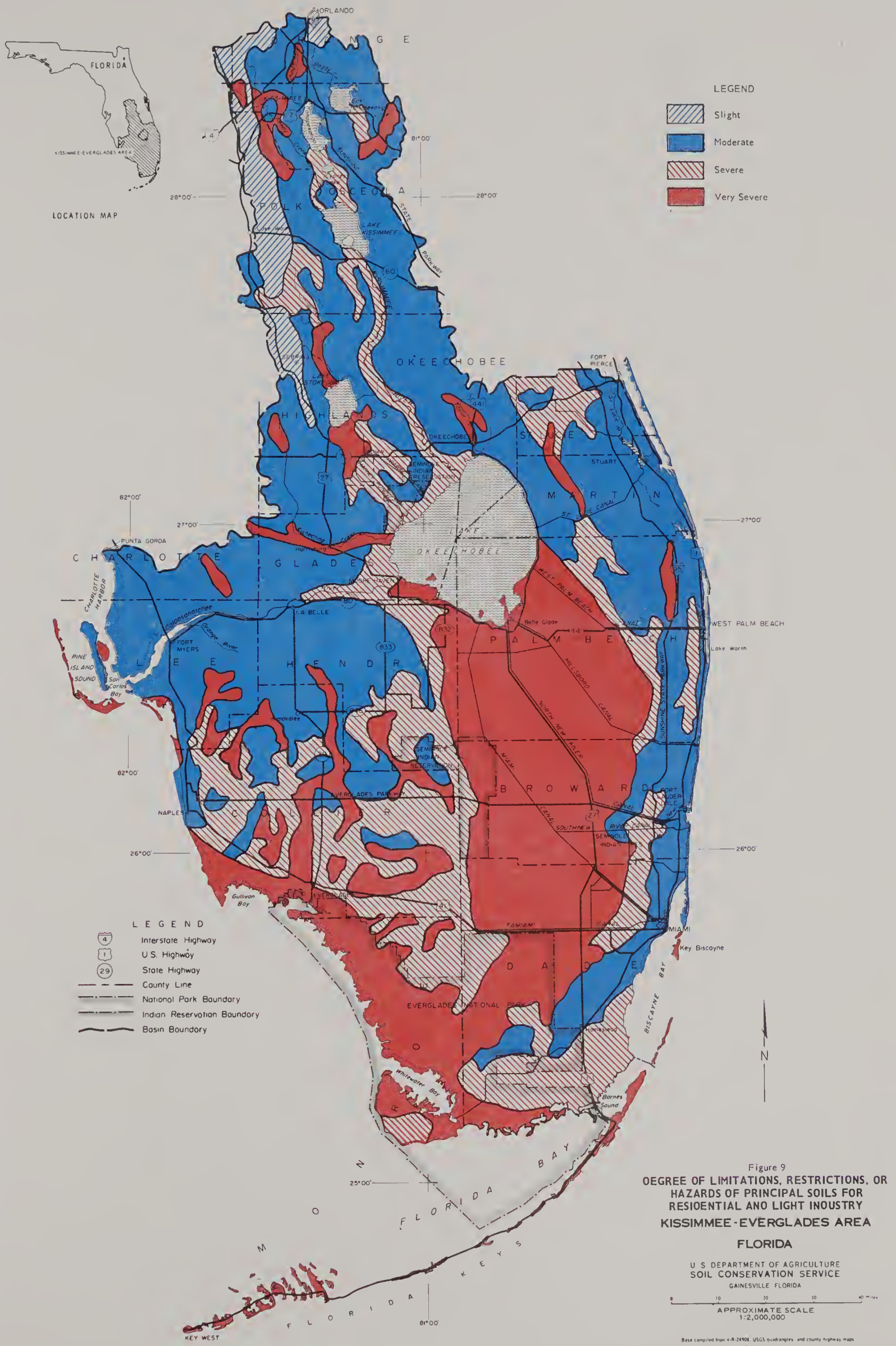

Figure 9

DEGREE OF LIMITATIONS, RESTRICTIONS, OR HAZARDS OF PRINCIPAL SOILS FOR RESIDENTIAL AND LIGHT INDUSTRY

KISSIMMEE-EVERGLADES AREA

FLORIDA

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
GAINESVILLE FLORIDA

Base compiled from 4-R-24908, USGS quadrangles and county highway maps
All planimetric detail taken from these sources

7-71 4-R-30574

May 1971

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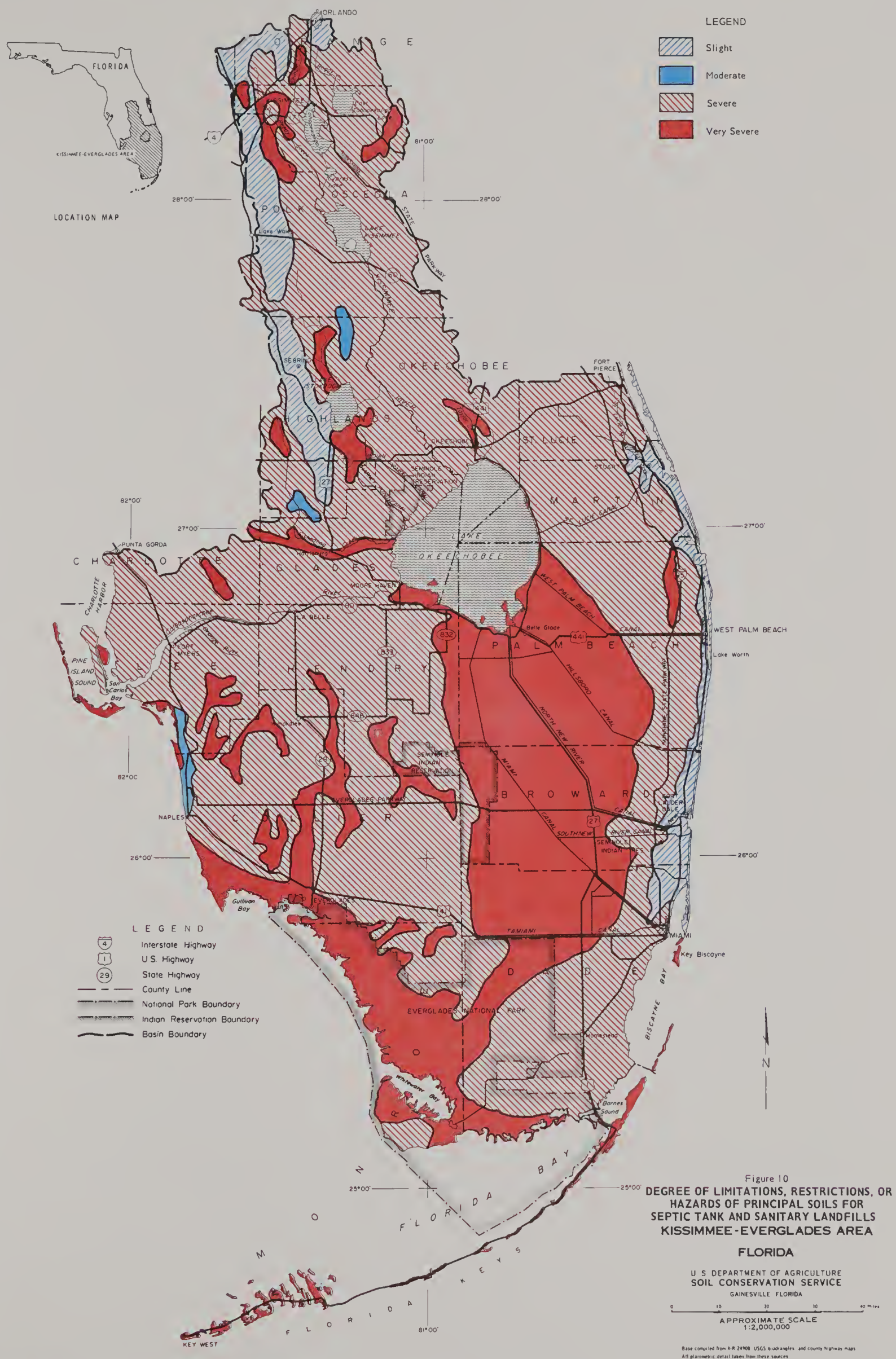

Figure 10

DEGREE OF LIMITATIONS, RESTRICTIONS, OR HAZARDS OF PRINCIPAL SOILS FOR SEPTIC TANK AND SANITARY LANDFILLS

KISSIMMEE-EVERGLADES AREA

FLORIDA

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
GAINESVILLE FLORIDA

0 10 30 30 40 Miles

APPROXIMATE SCALE
1:2,000,000

Base compiled from 4-R 24908 USGS quadrangles and county highway maps
All planimetric detail taken from these sources

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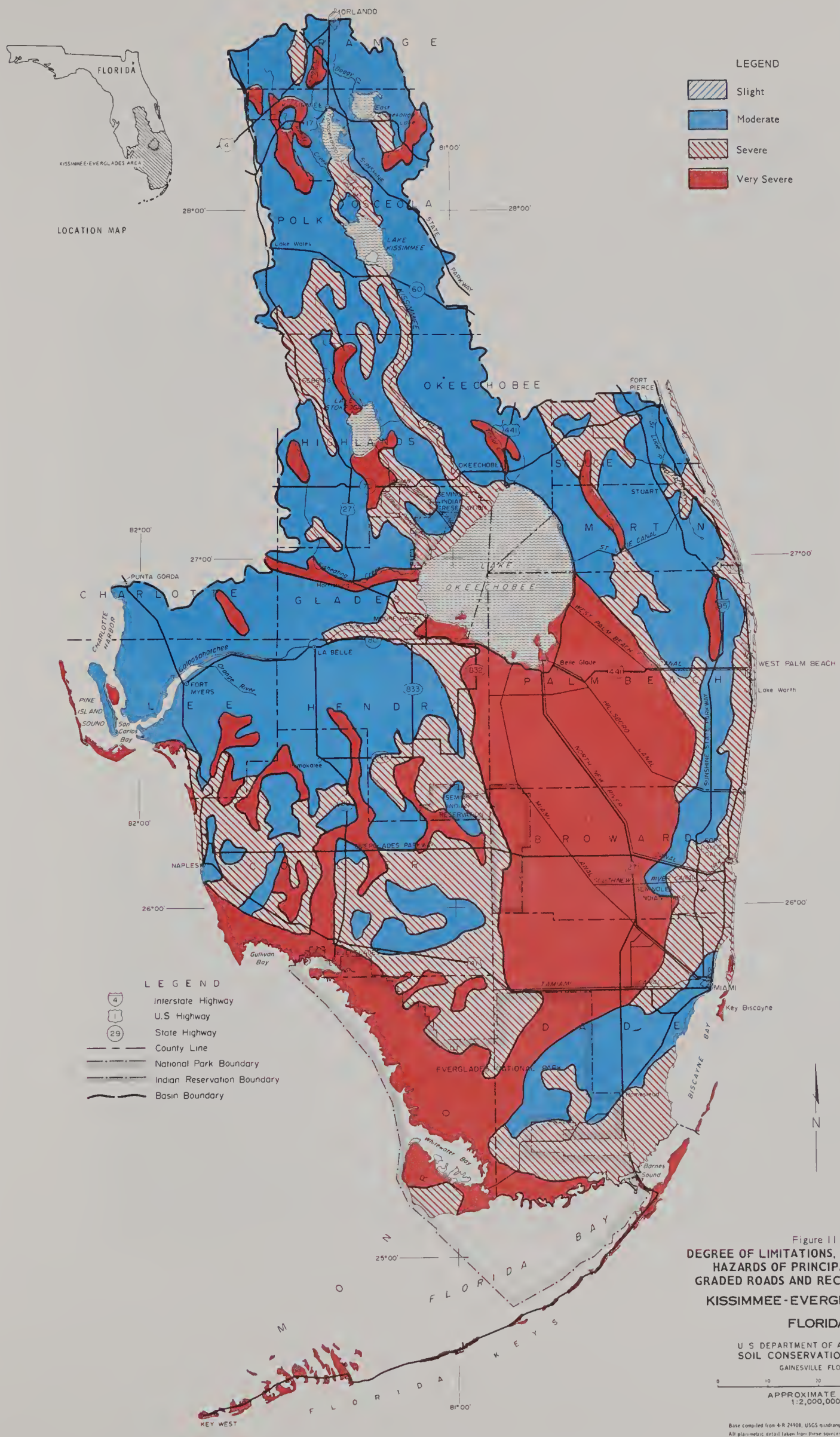

Figure 11

DEGREE OF LIMITATIONS, RESTRICTIONS, OR HAZARDS OF PRINCIPAL SOILS FOR GRADED ROADS AND RECREATION AREAS

KISSIMMEE-EVERGLADES AREA

FLORIDA

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SOIL CONSERVATION SERVICE
GAINESVILLE FLORIDA

APPROXIMATE SCALE
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Base compiled from 4-R 24908, USGS quadrangles and county highway maps
All planimetric detail taken from these sources

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May 1971

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NATIVE VEGETATION ENHANCES SCENIC BEAUTY

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S E C T I O N I I

ECONOMIC DEVELOPMENT

Historical Economic Conditions

Population

The 1970 population of the Basin was 2.8 million (Table 2-1), indicating a growth of over 900,000 people since 1960, or one-half the increase in Florida's population during this decade. Basin population has more than tripled since 1950. The percentage of the State's population residing in the Basin has increased from 31.4 percent in 1950 to 40.6 percent in 1970. Population in the United States from 1960 to 1970 increased about 13 percent. During this same period, Florida's population grew by 37 percent, while population in the Basin rose 50 percent. This rapid rate of growth has occurred primarily because of the growth in employment opportunities in the area. The favorable climate has also had a positive influence on population growth and has attracted a large number of retirees.

TABLE 2-1. - Population by county, Kissimmee-Everglades Area, 1950, 1960 and 1970

County	Population		
	1950	1960	1970
Broward	83,933	333,946	620,100
Charlotte[1/]	800	2,624	5,787
Collier	6,488	15,753	38,040
Dade	495,084	935,047	1,267,792
Glades	2,199	2,950	3,669
Hendry	6,051	8,119	11,859
Highlands[1/]	13,000	20,000	27,737
Lee	23,404	54,539	105,216
Martin	7,807	16,932	28,035
Monroe	29,957	47,921	52,586
Okeechobee[1/]	3,204	5,924	10,447
Orange[1/]	45,230	103,681	154,940
Osceola[1/]	11,000	18,500	24,509
Palm Beach	114,688	228,106	348,753
Polk[1/]	7,489	10,139	11,361
St. Lucie[1/]	18,680	33,118	43,211
Basin	869,014	1,837,299	2,754,042
State	2,771,305	4,951,560	6,789,433
% State	31.4	37.1	40.6

1/ Includes only portion of county within basin boundaries.

U. S. Bureau of Census, U.S. Census of Population, 1950, 1960 and 1970, Washington, D.C.

Broward, Dade and Palm Beach counties accounted for over 80 percent of the population growth within the Basin between 1960 and 1970. Population in Charlotte County more than doubled during this ten year period while Lee, Broward and Okeechobee counties all registered a gain of 75 percent or more.

The majority of the population in the Basin has been located in urban areas. The population in Broward, Dade and Palm Beach counties was 97 percent urban in 1970 compared to 66 percent urban for the remaining counties in the Basin. Population growth between 1950 and 1968 has occurred along both coasts while the interior of the Basin has remained in agriculture and is much less densely populated (Figure 12).

Net migration of 727,000 in the Basin between 1960 and 1970 represented over 80 percent of the population gain during this period. Approximately 55 percent of the net migration in Florida during this period occurred within the Area. The natural population increase of births exceeding deaths was larger than net migration in Hendry, Glades and Polk counties.

Employment

The large increase in Basin population has been closely related to a large growth in employment opportunities. The size of the civilian labor force has grown from 364,000 in 1950 to 1,044,000 in 1968 (Table 2-2). Approximately 42 percent of the State's employment was in the Basin in 1968.

Table 2-2. Civilian labor force, Kissimmee-Everglades Area and the United States, selected years 1950 to 1968

Sector	1950	1960	1963	1968
Agricultural employment	32,886	42,651	52,395	51,709
Non-agricultural employment	311,816	643,683	734,590	963,704
Total employment	344,702	686,334	786,985	1,015,413
Total unemployment	19,424	38,810	54,898	28,764
Total civilian labor force 1/	364,126	725,144	841,883	1,044,177
Basin unemployment rate	5.3	5.4	6.5	2.8
U. S. unemployment rate	5.3	5.5	5.7	3.6

1/ Does not include armed services.

Data from Bureau of Economic and Business Research, University of Florida and U. S. Bureau of the Census, U. S. Census of Population, 1950 and 1960, Washington, D.C.

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POPULATION–1968 AND PERCENTAGE GAIN FOR 1950–1968, BY COUNTIES

Kissimmee–Everglades Area

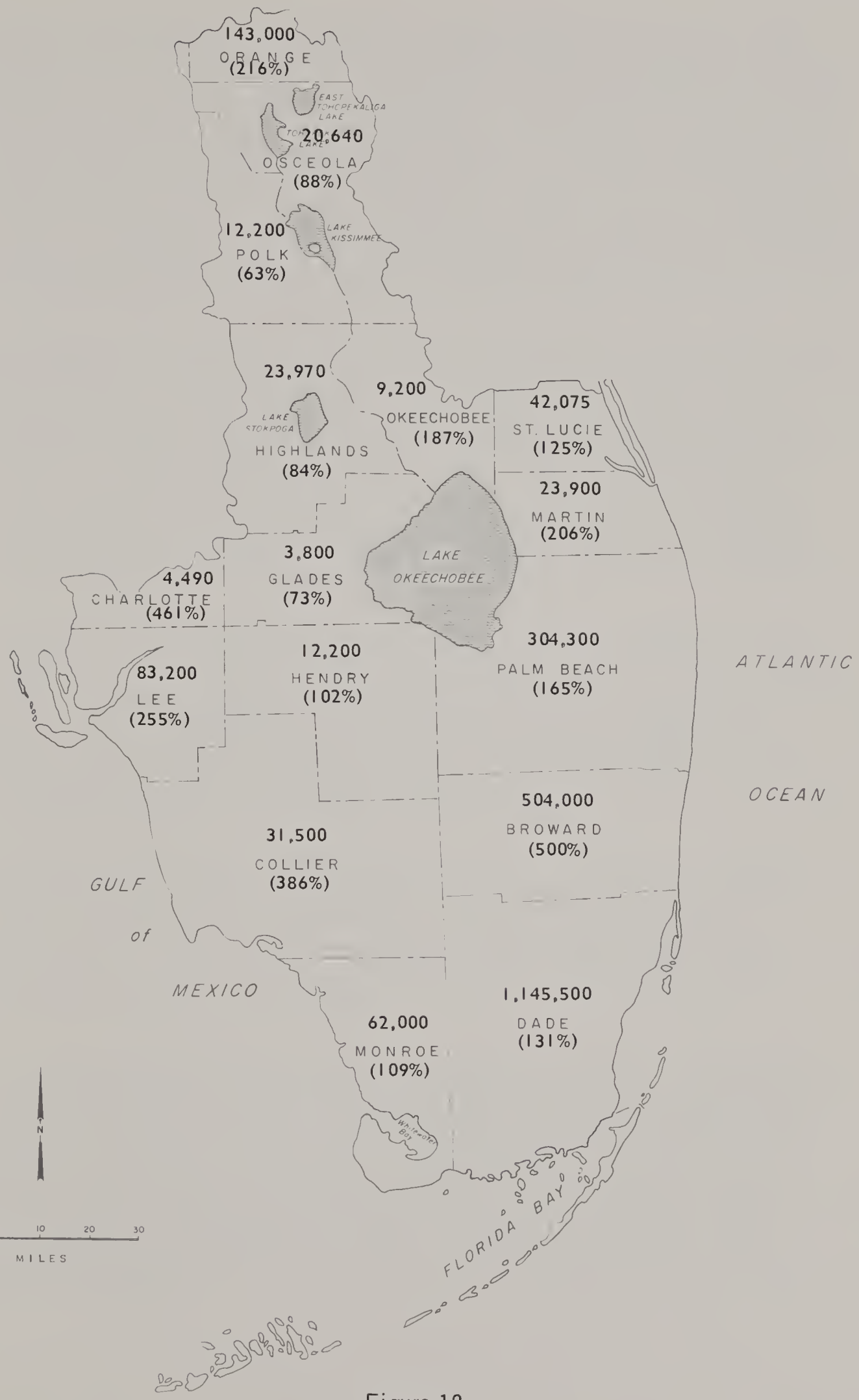

Figure 12

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U. S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, GAINESVILLE, FLORIDA
USDA-SCS-FORT WORTH, TEX. 1971

Strength of the Basin's economy is indicated by the fact that employment in each industry in the Basin except food and kindred products grew faster than the national average for that industry from 1950 to 1960. Many of the smaller industries in the Basin had very rapid growth rates, while some of the more established industries such as those associated with the tourist trade grew at slower rates than the Basin average. Total employment doubled during this period. Large gains were shown in contract construction, wholesale and retail trade, financial and personal services, manufacturing and in the medical and professional services.

Technology has improved agricultural efficiency and resulted in a large reduction in farm workers in most areas. This has not been the case in South Florida. The number of workers hired (150 days or more) in agriculture increased from 9,300 in 1954 to 25,200 in 1964, but agricultural employment has declined from 9.0 percent of the total in 1950 to 5.0 percent in 1968. The percentage of workers employed in agriculture is expected to continue to be higher in this area than in the U.S. because the crops grown here require intensive labor.

Employment in all phases of forestry is a small segment of the agricultural labor force with an estimated 900 full time workers in 1968. Of this number, nearly one-third are engaged in the protection and management of forestland with the remainder harvesting and hauling wood products, working at sawmills or operating wood treating plants. Collier, Osceola and Polk are the leading counties in forestry employment.

The number employed in Dade County (Miami) increased 330,000 between 1950 and 1968. Broward and Palm Beach counties also had large increases in employment. These three counties represented 84 percent of the gain in Basin employment from 1950 to 1968. Approximately 850,000 people were employed in this three-county area in 1968.

The Bureau of Economic and Business Research at the University of Florida has estimated county employment by major categories. Non-agricultural employment during this period increased from 735,000 to 964,000, (Table 2-3). Employment in manufacturing increased 46 percent. However, wholesale and retail trade which had the largest gain of all categories employed 55,900 more workers in 1968 than in 1963. Figure 13 indicates how total employment in the Basin was divided among major classifications in 1968.

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TABLE 2-3. Civilian labor force, by major classifications Kissimmee-Everglades Area, 1963 and 1968

Sector	1963	1968
Manufacturing	82,646	120,877
Construction	44,301	58,321
Transportation and public utilities	46,486	66,558
Wholesale and retail trade	167,566	223,479
Finance insurance and real estate	40,223	51,171
Services and miscellaneous	123,811	176,836
Government	80,400	114,662
Other non-agricultural employment	149,157	151,800
Total non-agricultural employment	734,590	963,704
Agricultural employment	52,395	51,709
Unemployment	54,898	28,764
Total civilian labor force	841,883	1,044,177

Data from Bureau of Economic and Business Research, University of Florida

Table 2-4 shows the components of change in Basin employment by major sectors. U. S. employment for all industries from 1950 to 1960 increased 15.5 percent. National growth represents the employment growth that would be represented if the industry had grown in the Basin at the national growth rate for all industries. Industrial mix represents an adjustment for industries that have grown at faster or slower rates nationally than the U. S. average for all industries. It is calculated by: (1) determining the national growth rate for each industry less the 15.5 percent national growth rate for all industries, and (2) applying this rate to the 1950 Basin employment in that industry. The Basin share represents the total employment change from 1950 to 1960 less the adjustments for national growth and industrial mix.

This analysis indicates that over 80 percent of the employment growth has been due to favorable employment conditions within the Basin rather than growth from a favorable mix of industries or an increase that parallels the national growth rate for all industries. Agriculture, mining, contract construction, transportation and wholesale and retail trade grew at a slower rate nationally than the U. S. growth rate for all industries. However, within the Basin the growth rate for these industries has exceeded the national growth rate for all industries.

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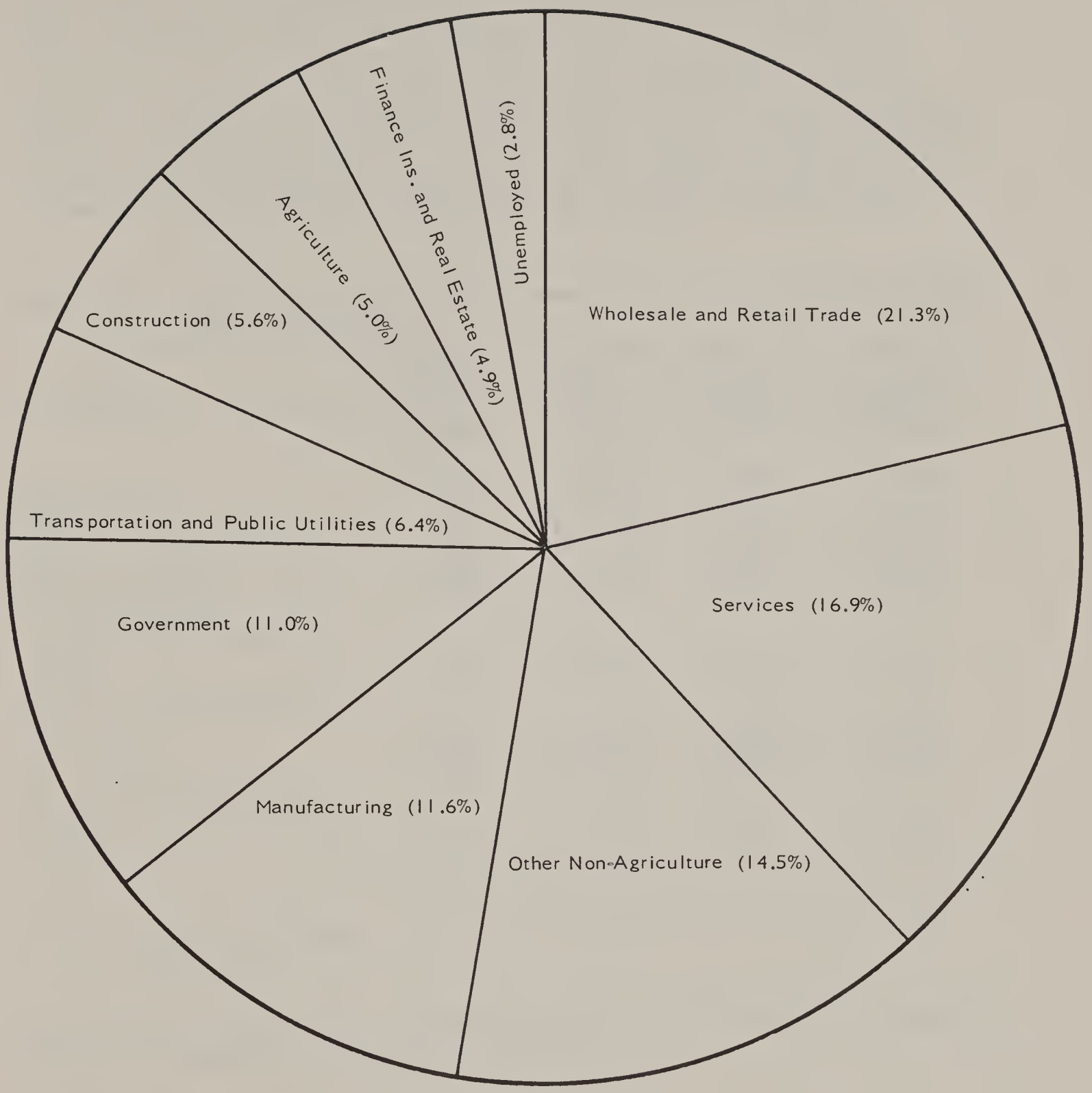

Figure 13

Distribution of Civilian Labor Force, Kissimmee-Everglades Area, 1968

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U. S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, GAINESVILLE, FLORIDA
USDA-SCS-FORT WORTH, TEX. 1971

None of the ten industries employing the largest number of employees in the Basin were among the Basin's ten largest water users. However, manufacturing of chemical and allied products, motor vehicle and transportation equipment manufacturing, and other machinery manufacturing, all of which are relatively small in terms of total employment ranked among both the top ten industries in terms of water use and rate of employment growth. In each of these industries, the growth has resulted from an increase in the Basin share rather than a more favorable mix of industries within the Basin. This growth in water-related industry suggests that resource development during this period has been a major factor responsible for growth in employment.

TABLE 2-4. Employment shift-share analysis, Kissimmee-Everglades Area, 1950-1960

Sector	National growth	Industrial mix	Basin share	Total change
	Number	Number	Number	Number
Agriculture	5,097	-17,495	22,163	9,765
Mining	92	- 262	675	505
Contract construction	5,657	- 876	19,457	24,238
Manufacturing	3,947	1,987	42,467	48,401
Transportation	4,733	- 3,817	24,806	25,722
Wholesale and retail trade	13,983	- 9,923	58,112	62,172
Finance, insurance and real estate	2,566	4,834	17,603	25,003
Services	14,381	20,597	59,939	94,917
Civilian government	2,194	2,194	10,985	15,373
Total civilian employment 1/	52,650	- 2,761	256,207	306,096

1/ Not reported category included in Table 2-2 is not included in these data.

Derived from Department of Commerce, Office of Business Economics, Regional Economics Information System.

Personal Income

Total personal income in the Basin in 1968 was $8.4 billion.2/ This represented 43 percent of Florida's personal income. Almost three-fifths of personal income came from wages and salaries, (Figure 14). Personal income earned from various industries is shown in Figure 15.

2/ Personal income is defined as the income from all sources received by the residents of a specific area. Both cash and in-kind income are included from both private and Government sources. Personal income is measured before tax deductions are made but it does not include personal contributions for social security. Earnings include wages, salaries and proprietors income.

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Wholesale and retail trade and services each accounted for approximately one-fifth of total earnings. Farm earnings accounted for only 5.2 percent. Broward, Dade, and Palm Beach counties received 84 percent of the Basin's personal income in 1968.

Income location quotients give an indication of the importance of a particular industry to the Basin's economy. An income location quotient is defined as:

$$\frac{\text{Basin earnings from industry A}}{\text{Basin earnings from all industries}} \Big/ \frac{\text{National earnings from industry A}}{\text{National earnings from all industries}}$$

If this ratio is less than unity, then industry A is not very important in the Basin relative to its national importance. If it is greater than one, then it is relatively more important in the Basin. The location quotients for the three largest sectors, wholesale and retail trade, services, and Government and other, have shown a decline since 1950 (Table 2-5). Other sectors showing a decline include contract construction, finance, insurance, and real estate. However, except for wholesale and retail trade, which has been declining relative to other industries, these industries have been contributing about the same share of total earnings as they have historically contributed. This means that earnings from these industries have not been growing as fast relative to total earnings within the Basin as they have in the United States. Industries whose income location quotients have been increasing include agriculture, manufacturing, and transportation, communications and public utilities. Farm earnings have declined percentagewise within the Basin but not as fast as elsewhere. The share of earnings from manufacturing and transportation, communications and public utilities have remained relatively constant.

TABLE 2-5. Location quotients by type of earnings, Kissimmee-Everglades Area, 1950, 1959 and 1968

Type of earnings	1950	1959	1968
		Quotients	
Government	.97	.93	.86
Manufacturing	.27	.36	.47
Mining	.08	.17	.21
Contract construction	1.77	1.73	1.42
Transportation, communications & public utilities	1.25	1.26	1.42
Wholesale and retail trade	1.36	1.22	1.23
Finance, insurance and real estate	1.58	1.47	1.36
Services	1.66	1.46	1.33
Other	2.43	2.48	2.21
Private non-farm earnings	1.01	.99	1.00
Farm earnings	.93	1.41	1.78
Total earnings	1.00	1.00	1.00

Office of Business Economics, Department of Commerce, Regional Economics Information System

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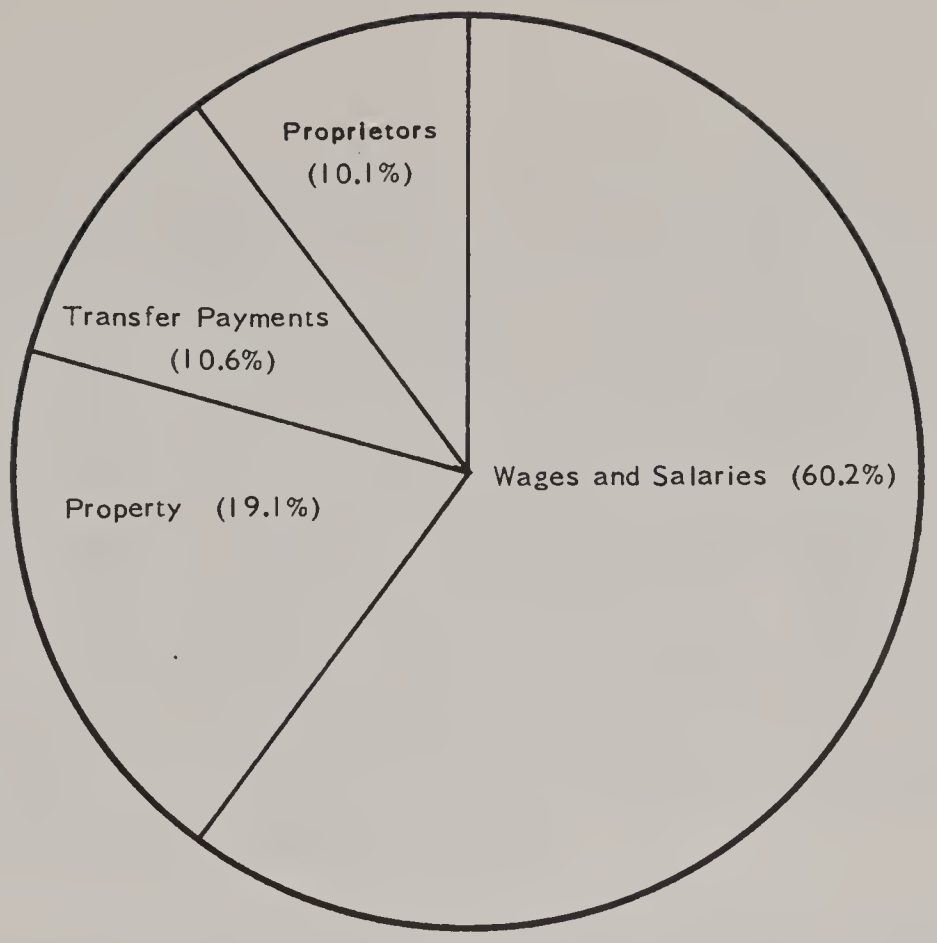

Figure 14

Personal Income by Major Sources, Kissimmee-Everglades Area, 1968

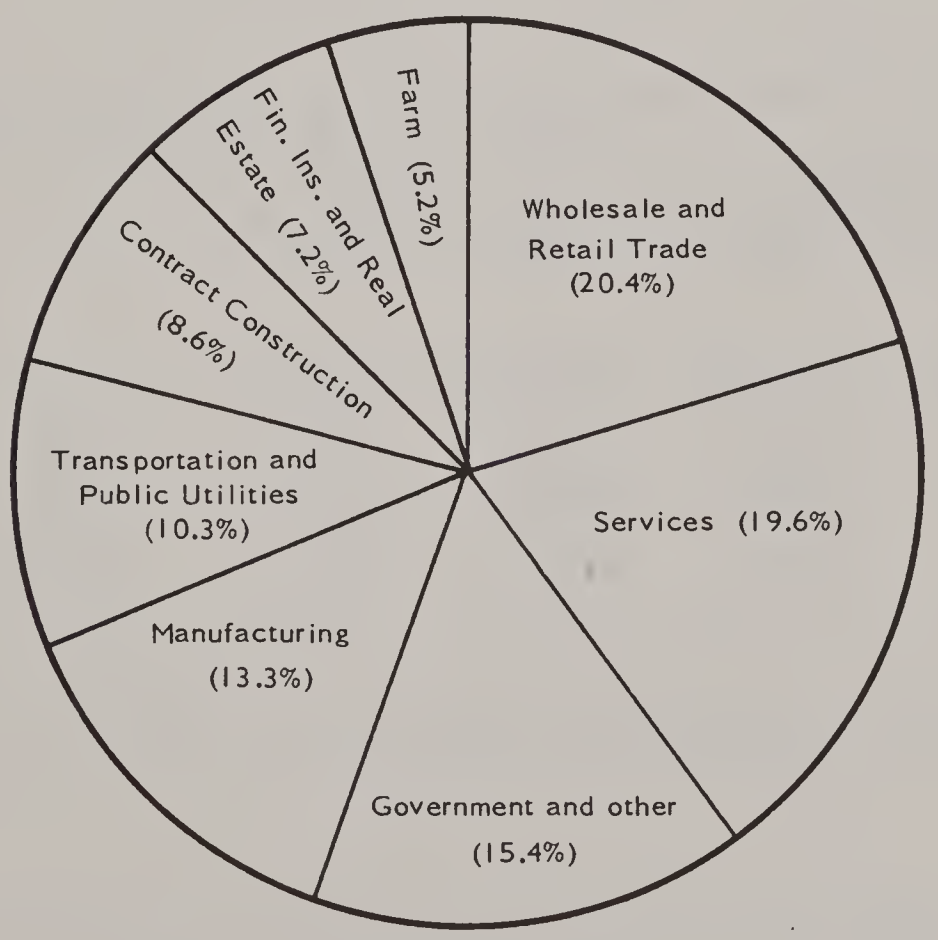

Figure 15

Personal Income by Sectors, Kissimmee-Everglades Area, 1968

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U. S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, GAINESVILLE, FLORIDA
USDA-SCS-FORT WORTH, TEX. 1971

Since 1950, income in both Florida and the Basin have been increasing at a rate about double that of the U. S. average. Much of this increase can be explained by the large growth in population which has resulted from favorable economic conditions. Real per capita personal income in the Basin has increased from $1505 in 1950 to $3534 in 1968. Average per capita income in 1968 was higher than the Florida average ($3191) or the National average ($3421). However, per capita income in 12 of the Basin's 16 counties was below the State and National average in 1968 (Figure 16). Per capita incomes in the Basin were highest in Dade, Monroe, and Palm Beach counties (Figure 17). These counties are all located in the southern part of the Basin. Counties which made the largest percentage gains in total personal income from 1950 to 1968 were Hendry, Palm Beach, and Broward. Dade county, which had the highest per capita income in 1968, increased its total personal income at a slower rate than many of the other Basin counties during the 1950-68 period.

Family incomes in the Basin in 1950 and 1960 were also higher than in the remainder of the State[1/]. Income per Basin family increased from $2818 in 1950 to $5065 in 1960 (Table 2-6). Family income in Florida increased from $2384 to $4722 during this same period. Only 25 percent of Basin families had incomes less than $3,000 in 1960. The percentage of families with incomes over $10,000 was slightly higher in the Basin than for the State.

TABLE 2-6. Distribution of families in income groups, Kissimmee-Everglades Area, 1950 and 1960

Income	Basin		State	
	1950	1960	1950	1960
Number of families	240,078	492,528	721,460	1,296,760
Number under $3,000	120,402	122,919	417,135	368,084
Percent under $3,000	50.2	25.0	57.8	28.4
Number over $10,000	9,450	63,883	18,665	144,457
Percent over $10,000	3.9	13.0	2.6	11.1
Median family income[1/]	$2,818	$5,065	$2,384	$4,722

U. S. Bureau of the Census, U. S. Census of Population, 1950 and 1960, Washington, D.C.

1/ Figures listed for the Basin are an average of the median income for each county weighted by its population.

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Tourism

The Florida Department of Commerce collects data each year relating to the Florida tourist industry. Tourist surveys were completed by tourists entering Florida by automobile, plane, train and bus each month during 1968. Visitors on shopping trips, those in transit to points outside the U. S. and those visiting Florida for strictly business reasons, were not classified as tourists nor were out-of-state military personnel or students.

The Basin has a large number of recreational attractions to promote tourism in addition to its climate and beaches. Over 8 million tourists visited the Basin in 1968. Facilities to accomodate this number include 2650 motels and hotels with over 110,000 units, numerous apartments and camp grounds. Basin tourists' expenditures are not available. However, using State averages based on 25,000 surveys, an indication of the economic effect of the tourist industry can be established. The average tourist stayed 15.6 days and spent $275. This would indicate that tourists spent approximately 2.2 billion dollars in the Basin in 1968. About one billion dollars was spent for food, drink and lodging.

Tourists also pay a large amount of taxes. In 1968, 105 million dollars was collected from Basin tourists for sales, gasoline, cigarettes and beverage taxes and hunting and fishing licenses.

A total of 5.9 million automobile tourists visited the Basin in 1968. These tourists represented approximately 73 percent of the total, while those arriving by plane represented about 23 percent of the total. Broward and Dade counties attracted the largest number of automobile tourists in 1968. However, there were seven Basin counties where 100,000 or more automobile tourists visited (Table 2-7).

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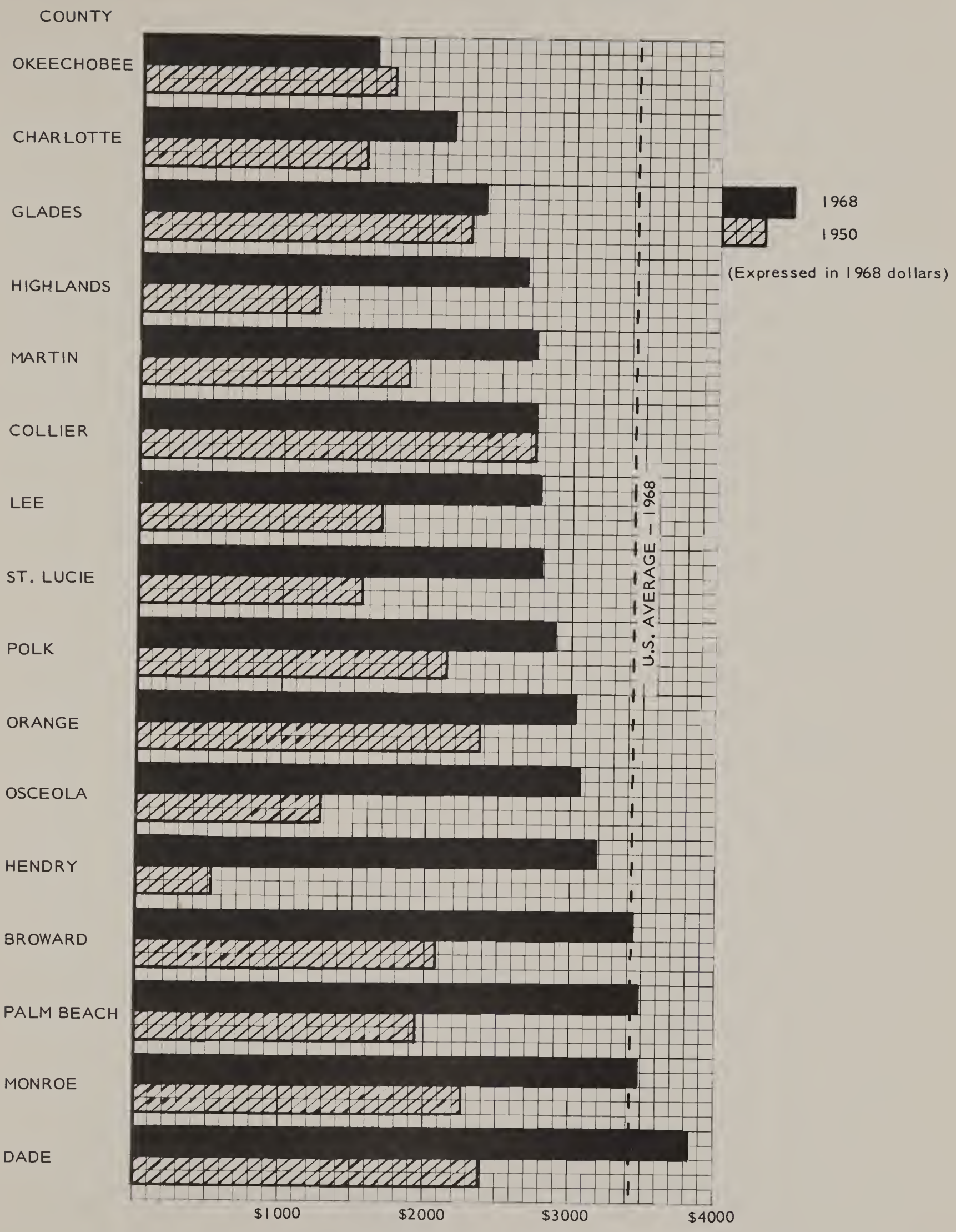

Figure 16

Per Capita Income by Counties, Kissimmee-Everglades Area, 1950 and 1968

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U. S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, GAINESVILLE, FLORIDA

USDA-SCS-FORT WORTH, TEX. 1971

PER CAPITA INCOME BY COUNTIES
1968
Kissimmee–Everglades Area

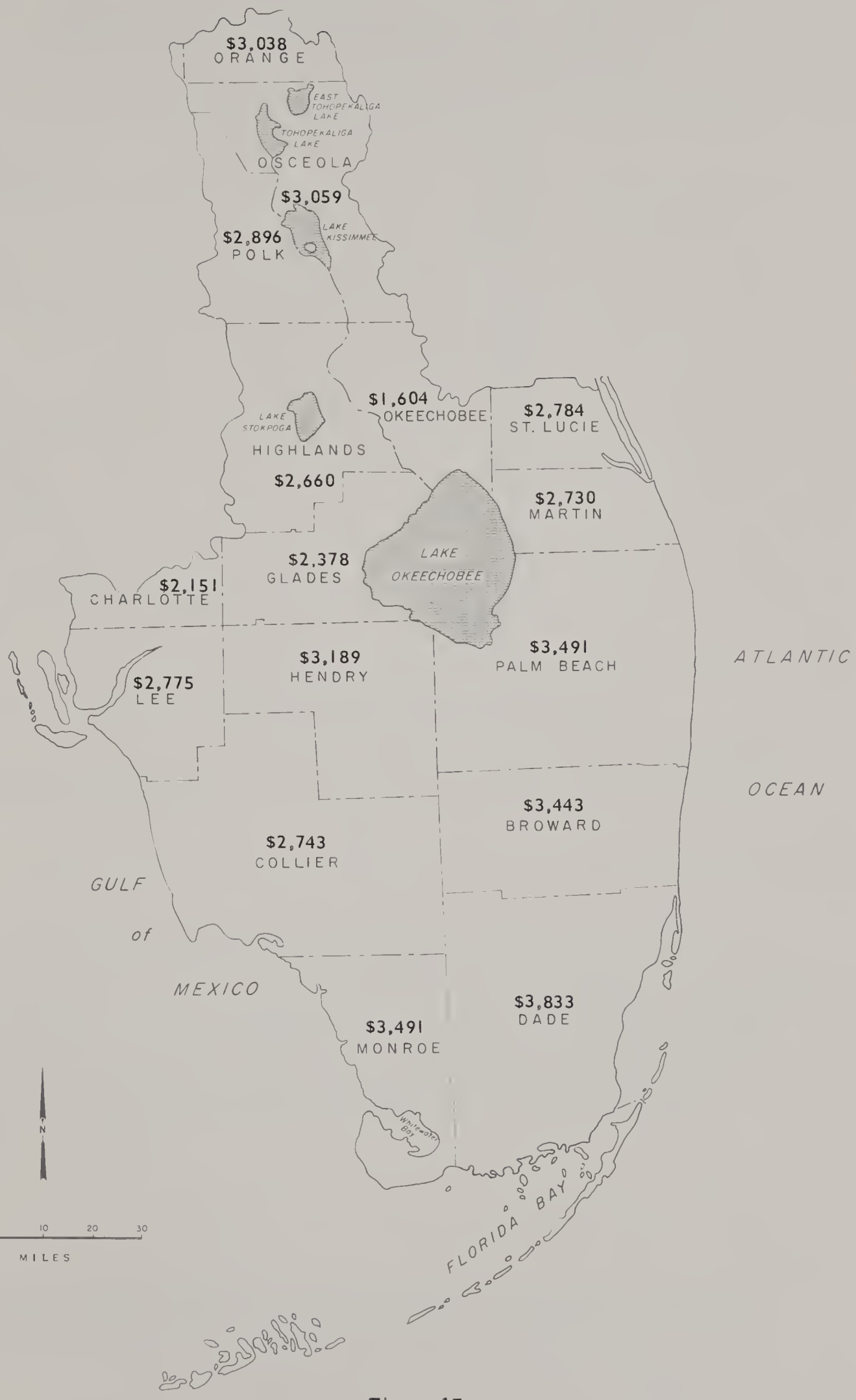

Figure 17

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U. S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, GAINESVILLE, FLORIDA
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TABLE 2-7. Destinations of incoming automobile tourists by counties, Kissimmee-Everglades Area, 1968

County	Tourists (thousands)
Broward	1,234
Charlotte[1/]	12
Collier	135
Dade	1,904
Glades	1
Hendry	4
Highlands[1/]	52
Lee	398
Martin	46
Monroe	375
Okeechobee[1/]	11
Orange[1/]	229
Osceola[1/]	29
Palm Beach	466
Polk[1/]	12
St. Lucie[1/]	51
No Specific Destination	913
Basin	5,872

1/ Adjusted to reflect portion within Basin boundaries.

Department of Commerce, State of Florida, Florida Tourist Survey, 1968, Tallahassee, 1969.

Outdoor Recreation

The Florida Outdoor Recreation Development Council in 1965, surveyed Florida residents in an attempt to estimate participation in selected outdoor recreation activities by regions for the entire State. Similarly, participation by tourists was estimated from data obtained in 1964 and 1965, from separate winter and summer surveys of tourists entering Florida. Resident and tourist participants in the Kissimmee-Everglades Area were obtained from these surveys.[1/]

1/ Information for outdoor recreation was supplied by Division of Recreation and Parks, State of Florida, Tallahassee, Florida

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The most popular activity among Basin residents in 1965 was the category beach activites, followed by picnicking and saltwater swimming (Table 2-8). No attempt was made to quantify such activities as driving and walking for pleasure.

TABLE 2-8. Outdoor recreation participation by residents and tourists, Kissimmee-Everglades Area, 1965

Activity	Resident population		Tourist population	
	Percent	Rank	Percent	Rank
Beach activities	61.4	1	44.0	1
Picnicking	55.5	2	17.5	5
Swimming in saltwater	45.5	3	36.0	2
Visiting historical sites	29.8	4	23.4	4
Fishing in saltwater	29.4	5	26.3	3
Fishing in freshwater	27.8	6	8.7	8
Swimming in freshwater	27.5	7	10.4	7
Boating	24.1	8	13.8	6
Camping	18.1	9	5.5	10
Water skiing	10.6	10	4.7	11
Nature study	10.0	11	5.7	9
Hunting	7.5	12	1/	13
Hiking	4.5	13	3.6	12

1/ Insignificant

Department of Commerce, State of Florida, Florida Tourist Survey, 1964 and 1965, Tallahassee, Florida

Total participation figures for the resident and tourist population are shown in Table 2-9. The greatest number of user-occasions were in beach activities, followed by saltwater swimming and boating. The rankings differ from those in Table 2-8 because the participation rates per person in each activity differ.

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TABLE 2-9. Outdoor recreation participation by residents and tourists aged 12 or older, Kissimmee-Everglades Area, 1965

Activity	User Occasions: Residents	Tourist	Total
Beach activities	21,063,000	13,100,500	34,163,500
Swimming in saltwater	17,496,500	11,028,500	28,525,000
Boating	9,898,000	3,948,000	13,846,000
Fishing in freshwater	9,306,500	2,516,500	11,823,000
Picnicking	9,271,500	4,200,000	13,471,500
Fishing in saltwater	8,890,000	8,396,500	17,286,500
Swimming in freshwater	5,841,500	2,887,500	8,729,000
Water skiing	3,174,500	973,000	4,147,500
Nature study	3,132,500	1,802,500	4,935,000
Camping	1,473,500	1,400,000	2,873,500
Hunting	1,337,000	1/	1,337,000
Visiting historical and archaeological sites	1,172,500	5,775,000	6,947,500
Hiking	588,000	787,500	1,375,500
Total	92,645,000	56,815,500	149,460,500

1/ Insignificant

Department of Commerce, State of Florida, Florida Tourist Survey, 1964 and 1965, Tallahassee.

Florida Outdoor Recreation Development Council, Outdoor Recreation in Florida, 1965, Tallahassee, Florida, 1968.

The resident participation data represents only a part of the total demand for outdoor recreation in the Basin. Tourists must be added to this data to get the total number of outdoor recreationists. Tourist demand corresponds generally to the same pattern as that of resident demand.

Visiting historical sites is more popular among tourists than among residents, as tourist occasions exceed resident by more than three to one, (Table 2-9). Saltwater swimming and fishing are especially popular among tourists as well. The highest number of user-occasions by tourists occurs in beach activities, just as it does for residents, and similarly is followed by swimming in saltwater.

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Combining the resident and tourist participation figures for 1965 gives some estimates of the recreation picture for the Basin. In 1965, combined outdoor recreation occasions for residents and tourists in the State totaled 444 million. Approximately 150 million occasions which represent about 35 percent of the State's total occurred in the Kissimmee-Everglades Area.

Future Economic Conditions

Population

Population projections were based primarily on projections made by the Florida Social Sciences Advisory Committee. However, past rates of growth, population densities, and information provided by the Bureau of Economic and Business Research at the University of Florida and Office of Business Economics, U. S. Department of Commerce, were considered.

The Basin's population is expected to increase from 2.8 million in 1970 to 3.4 million in 1980. (Table 2-10). Population is expected to reach 5.1 million in 2000 and 6.7 million in 2020.

TABLE 2-10. Population, Kissimmee-Everglades Area - 1970, 1980, 2000 and 2020

Item	1970	1980	2000	2020
		thousand persons		
Urban	2520	3165	4720	6260
Rural	234	277	357	437
Basin	2754	3442	5077	6697
Percent of Florida	41.6	40.0	41.0	41.0

The percentage of urban residents in the Basin is expected to continue to increase from 91.5 percent in 1970 to 93.5 percent in 2020.

Historically, the Basin population has grown at a faster rate than that of the rest of the State. It is projected that land will be available for growth to continue. Densities in the population centers are increasing, and it is expected that large numbers of apartments and condominiums will cause this density to become much higher in the future.

Employment

Increases in employment are closely associated with increases in population. Historically, a one percent increase in Basin population has resulted in a .4 percent increase in the number of jobs. This proportion has remained relatively constant since 1940.

Projections for total employment were based on the historical population-employment ratio and employment projections made for the Lake Okeechobee Water Resources Planning Area.1/ Projections for agriculture and manufacturing were also made this way. Projections for other categories were based on the proportion of Basin employment represented by each sector. Census data and data from the Bureau of Economics and Business Research were used to develop these trends.

Total civilian employment is expected to increase from 1.0 million in 1968 to 1.3 million in 1980 and 2.7 million in 2020 (Table 2-11). All employment categories show increases with the exception of agriculture. Estimates for agriculture do not include seasonal employment which is expected to increase if the Basin is to supply its projected share of agricultural commodities. However, due to rising labor costs and new technology, capital is expected to substitute for a large amount of seasonal labor.

The percentage of full-time employees in agriculture is expected to decline from 5.0 percent of the labor force in 1968 to only 1.6 percent of the labor force in 2020. Employment in manufacturing is expected to increase at a faster rate than other categories. However, the largest gains in employment are projected to be in the personal services category. Employment opportunities will continue to be concentrated in the southern part of the Basin. However, the establishment of Disney World near Orlando is expected to generate a large amount of additional employment opportunities in the northern part of the Basin.

1/ Projections for this area were made by the Office of Business Economics, U. S. Department of Commerce. It includes essentially the same counties as in the Kissimmee-Everglades Area except Orange, Polk and Charlotte, which are partially in the Basin but are not in the planning area. Indian River County is not in the Basin but is in the planning area.

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TABLE 2-11. Civilian employment by major sectors - 1968, 1980, 2000 and 2020 - Kissimmee-Everglades Area

Sector	1968	1980	2000	2020
Agriculture	51,709	45,600	44,700	43,900
Manufacturing	120,877	161,100	247,800	343,200
Construction	58,321	73,800	107,600	142,800
Trans. & public utilities	66,558	80,500	111,700	137,300
Wholesale & retail trade	223,479	295,300	446,800	604,100
Finance ins. & real estate	51,171	67,000	103,600	142,800
Services incl. government	291,498	402,700	609,200	823,700
All other workers	151,800	216,400	359,400	508,000
Total employment	1,015,413	1,342,400	2,030,800	2,745,800

Personal Income

Projections of total personal income in 1980 were based on the changes in per capita income in the Basin from 1950-1968 and projections made for the Lake Okeechobee Water Resources Planning Area by the Office of Business Economics, U. S. Department of Commerce. Projections for 2000 and 2020 were based on the assumption that increases would continue at the same rate through 2020. These projections are based on the healthy economic conditions in the area and the continued growth in employment opportunities projected in the previous section.

Per capita income in terms of 1968 dollars is projected to increase from $3534 in 1968 to $4800 in 1980 (Table 2-12). Income in 2020 is expected to reach $9500 per capita. Total personal income is expected to double detween 1968 and 1980. If population and employment expand at the projected rate, total personal income is expected to reach 63.6 billion by 2020 (Figure 18).

TABLE 2-12. Personal income 1968, 1980, 2000 and 2020 (1968 dollars) - Kissimmee-Everglades Area

Year	Total personal income billion dollars	Per capita dollars
1968	8.4	3534
1980	16.6	4800
2000	35.5	7000
2020	63.6	9500

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PROJECTIONS	1968	1980	2000	2020
POPULATION	2.4 Mil.	3.4 Mil.	5.1 Mil.	6.7 Mil.
EMPLOYMENT	1,015,413	1,342,400	2,030,800	2,745,800
PER CAPITA INCOME	$3,534 (1968 $)	$4,800	$7,000	$9,500
PERSONAL INCOME	$8.4 Bil. (1968 $)	$16.5 Bil.	$35.5 Bil.	$63.6 Bil.

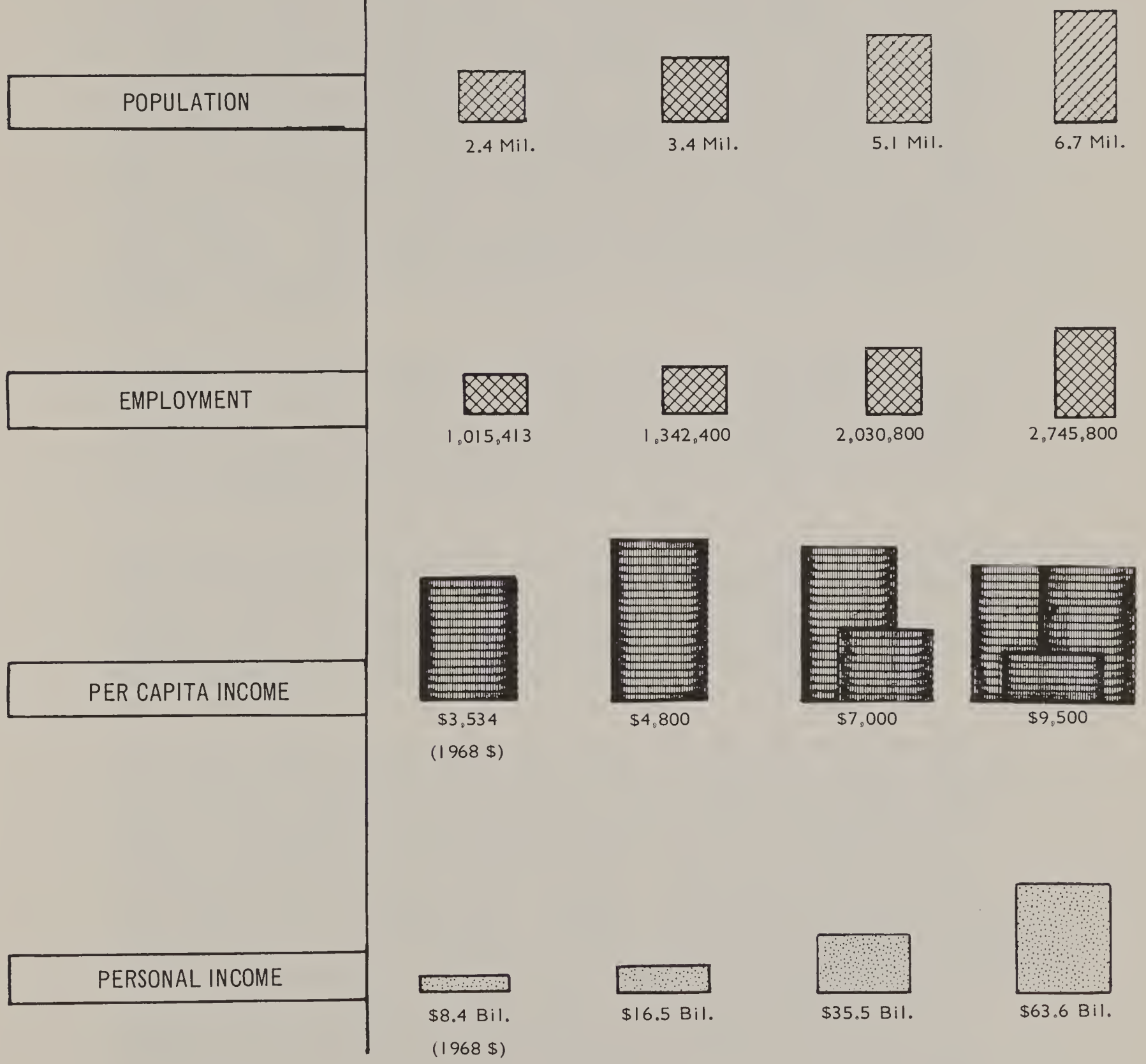

Figure 18

Economic Growth Projections, Kissimmee-Everglades Area,
1968 and 1980, 2000 and 2020 Projected

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U. S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, GAINESVILLE, FLORIDA

USDA-SCS-FORT WORTH, TEX. 1971

Historical Agricultural Conditions

General

The agricultural sector is very important to the Basin's economy in terms of capital investment, income and employment. Sales of all farm products from the Basin increased from $189.0 million in 1954 to $373.9 million in 1964 (Table 2-13)1/. Sales in 1968 were estimated to be $480.4 million. The Basin's share of State sales has increased slightly in past years (Figure 19). In 1954, farm marketings in the Basin represented 31.3 percent of State sales. This share had increased to 36.9 percent in 1968. Large increases in vegetable and citrus sales have occurred during the last decade. The livestock industry has made little increase in total sales. Crop sales accounted for 82 percent of the sales in 1964. Vegetables contributed 36 percent of total sales in 1968 (Figure 20).

In 1968, forestland owners received $700,000 in payment for pulpwood, logs for lumber and veneer, posts, poles and stumpwood. Payrolls for timber harvesting and hauling exceeded $1 million and payrolls for primary manufacturing were about $2.8 million. It is estimated that employees in the forestry phase of agriculture received approximately $4.4 million.

Palm Beach and Dade counties were the leading counties in terms of farm products sold in 1964. Figure 21 indicates how sales are concentrated in the eastern portion of the Basin. Citrus is produced mainly in the northern portion of the Basin. Sugarcane and vegetables are the principal sources of receipts south of Lake Okeechobee.

The total impact of agriculture is not limited to the value of farm products sales. These sales have a multiplier effect which generate more employment investment, and income from Basin residents. In addition to the multiplier effects created by farm sales, the inputs used in agricultural production also create an expansionary effect on the economy. Complete data on total farm costs are not available. However, the Census of Agriculture presents data concerning major items of farm expenditures (Table 2-14). The outlays for each item represent the total for all farms in the Basin, including those made by the farm operator, the landlord or other persons providing the item under terms of a contract or agreement. These expenses totaled $200.8 million in 1964, which represented 41.8 percent of total farm receipts. Several farm expenditures such as maintenance and repairs, depreciation, interest, pesticides, irrigation and insurance payments are not included in these estimates.

1/ 1968 Dollars

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TABLE 2-13. Value of farm product sales and share of State sales, Kissimmee-Everglades Area, 1954, 1959 and 1964

Commodity	Basin sales			Share of State sales		
	1954	1959	1964	1954	1959	1964
	Million dollars 1/			Percent		
Vegetables	67.5	70.4	112.4	66.5	72.0	68.6
Fruits and nuts	39.2	60.7	102.6	16.1	15.7	22.8
Field crops	20.2	20.7	55.3	25.8	30.5	43.3
Forest and horticultural products	16.4	30.3	35.0	40.7	45.3	46.9
All crops	143.3	182.1	305.3	30.6	29.4	37.4
Poultry	3.6	4.9	5.4	15.6	14.0	8.5
Dairy products	23.6	36.6	37.4	42.1	43.7	38.8
Beef and other livestock	18.5	28.9	25.8	30.8	29.6	27.7
All livestock products	45.7	70.4	68.6	32.8	32.5	27.2
Total farm products	189.0	252.5	373.9	31.3	30.2	35.0

1/ 1968 dollars.

U. S. Bureau of the Census, Census of Agriculture, 1954, 1959, 1964 Washington, D.C.

TABLE 2-14. Selected farm expenditures, Kissimmee-Everglades Area, 1959 and 1964

Item	1959	1964
	Million dollars	
Feed for livestock and poultry	25.4	26.1
Livestock and poultry purchases	16.6	12.1
Seed, bulbs and plants	6.4	7.5
Fertilizer	NA	34.6
Fuel and oil	7.2	9.4
Machine hire, custom and contract work	6.2	27.7
Hired labor	58.6	83.4
Total expenditure	120.4	200.8

U. S. Bureau of the Census, U. S. Census of Agriculture, 1959 and 1964, Washington, D.C.

4-30265 5-73

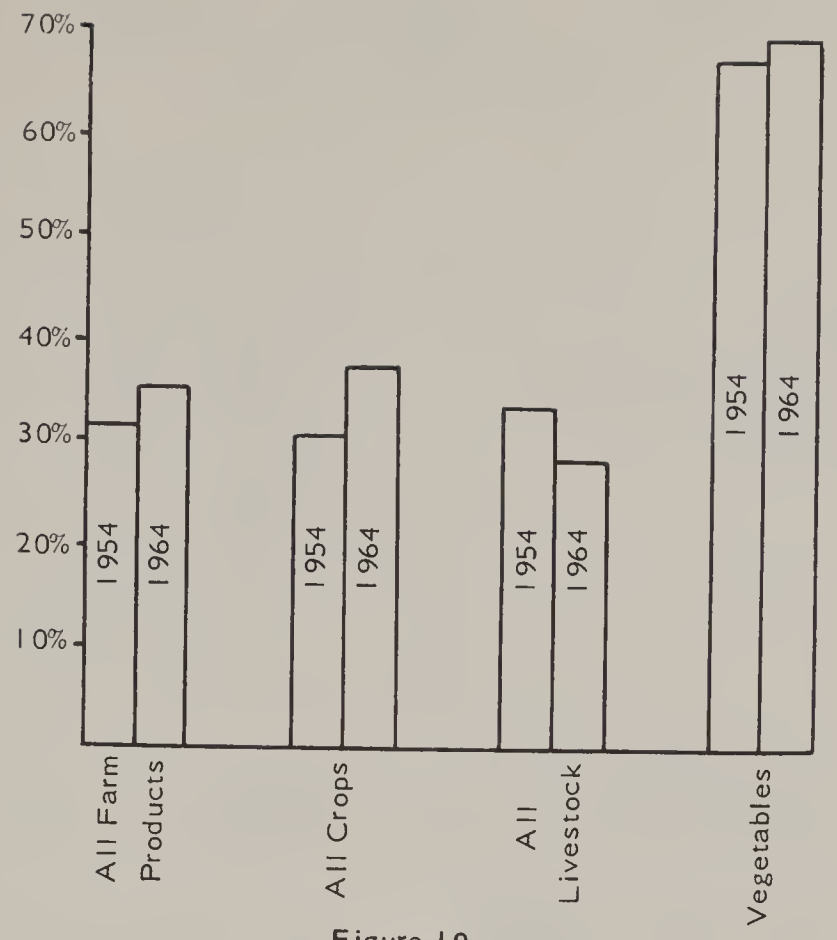

Figure 19

Share of State Sales Represented by Kissimmee-Everglades Commodities, 1954 and 1964

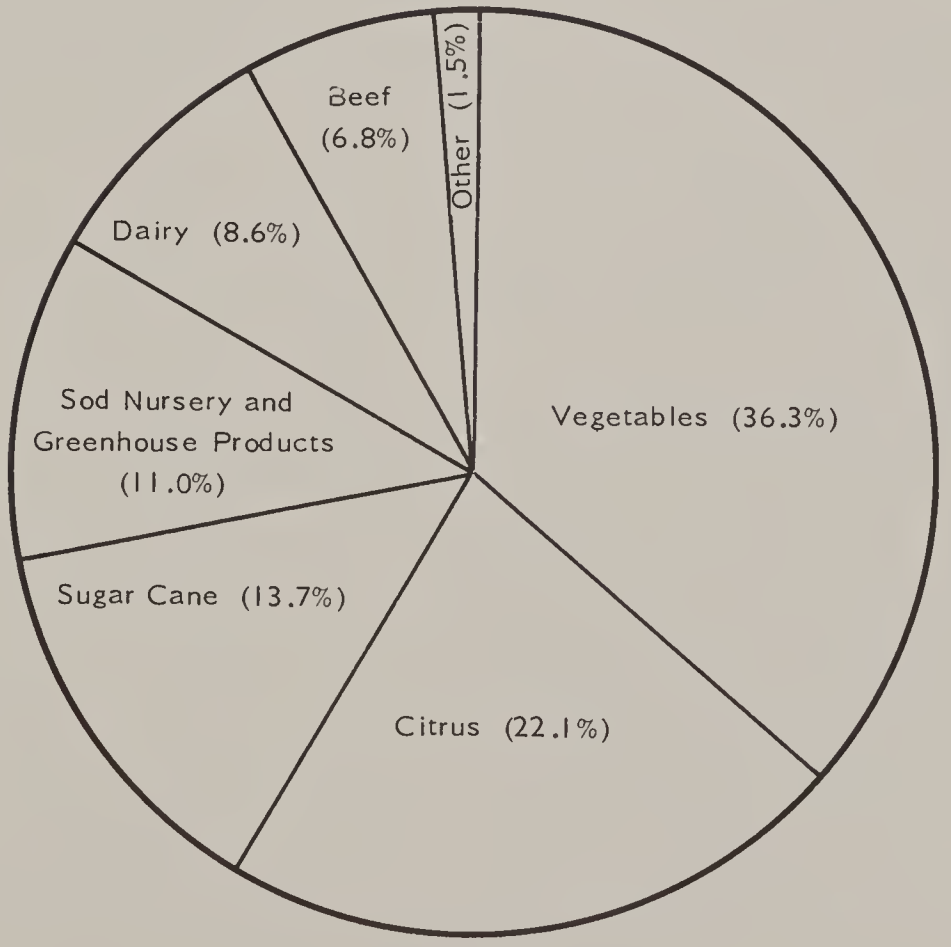

Figure 20

Share of Farm Sales Represented by Commodity Groups, Kissimmee-Everglades Area, 1968

4-30265 4-71
U. S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, GAINESVILLE, FLORIDA
USDA-SCS-FORT WORTH, TEX. 1971

VALUE OF FARM SALES BY COUNTIES
1964
Kissimmee–Everglades Area

Figure 21

4–30265 5–71
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The value of land and buildings in 1964 exceeded $1.5 billion. This represented an average investment per farm in excess of $275,000. Many Basin farms are very large commercial operations which heavily influence these averages. However, these estimates give a broad indication of the size and importance of the agricultural sector to the Basin economy.

Farm numbers have declined from 7,700 in 1954 to 5,700 in 1964, a decrease of about 25 percent. Approximately 4,000 farms in 1964 were classified as commercial ($2,500 or more in sales). During the 1954-1964 period, the average farm size increased from 660 acres to 780 acres. In 1964, there were 520 farms which were over 1,000 acres in size and 340 of these were over 2,000 acres. Thirty-one percent of the commercial farms had sales in excess of $40,000 in 1964.

Land Use

Land use information utilized in this report was developed from USDA field survey for the base year 1968. In 1968, 72 percent of the land was used for agricultural purposes (Figure 22). Crops were grown on 782,900 acres while 3.1 million acres were used for pasture and range (Table 2-15). The remainder of the agricultural land was in forest and miscellaneous uses.

Land in farms has declined 12 percent during the last decade, but the acreage of cropland harvested has increased by almost 65 percent. Palm Beach County had 300,000 acres of cropland in 1968, almost 5 times as much as any other county.

Forestland, including 804,700 acres of non-commercial types, comprises 20 percent of the total land area, or 1,993,400 acres. The largest acreages of commercial forestland are in Collier, Osceola, Polk and Hendry counties. All other counties have less than 100,000 acres each.

Non-agricultural land totaled 2.8 million acres in 1968. Approximately 1.8 million acres of this is in wildlife areas, recreation areas, state and county parks, and the Everglades National Park. These areas contribute substantially to tourism by providing space for outdoor recreation opportunities.

Increased demands for roads and residential areas due to expanding population have exerted pressures on the land resources formerly used for agriculture. Purchases of large blocks of land for residential development or speculation have become common. Urban and built-up areas totaled 861,000 acres in 1968.

4-30265 5-73

4-30265 5-73

TABLE 2-15. Land use, and water areas by counties, Kissimmee-Everglades Area 1968

County	Total Area	Agriculture: Citrus	Other Crops	Improved Pasture	Range	Forest-Land	Other (Misc)	Non-agriculture: Reserve Area	R.O.W. roads	Urban & Built-up	Water: Fresh	Salt
	1,000 Acres											
Broward	780.8	6.3	18.1	31.2	19.5	19.3	73.2	465.7	2.9	137.0	3.1	4.5
Charlotte	241.3	1.6	9.4	12.4	113.7	50.4	19.5	1.0	1.7	14.5	0.1	17.0
Collier	1356.2	4.6	16.8	39.2	308.5	542.3	303.3	44.2	7.5	34.1	2.5	53.2
Dade	1349.8	4.4	48.0	6.3	0.0	18.7	402.5	598.7	6.8	207.1	3.3	54.0
Glades	615.4	2.4	12.2	107.4	232.4	100.3	7.7	0.0	7.0	3.0	143.0	0.0
Hendry	776.3	27.2	27.1	268.0	230.3	182.8	1.9	0.8	13.1	8.2	16.9	0.0
Highlands	677.5	43.5	4.9	130.0	170.5	227.5	3.0	2.3	7.8	38.4	49.6	0.0
Lake	12.4	6.0	0.0	0.5	0.0	3.2	1.5	0.0	0.0	0.0	1.2	0.0
Lee	643.2	4.9	15.8	34.5	169.3	99.9	49.9	6.4	6.5	104.4	0.3	151.3
Martin	435.8	44.6	5.2	57.0	111.7	87.7	9.5	9.6	8.6	25.0	63.1	13.8
Monroe	907.5	0.0	0.0	0.0	0.0	13.3	147.9	453.8	C.0	46.8	0.0	245.7
Okeechobee	477.1	1.7	2.3	133.3	199.1	48.0	4.0	0.0	6.0	5.2	77.5	0.0
Orange	199.2	23.4	0.0	23.4	15.6	75.9	8.0	0.2	4.9	30.0	17.8	0.0
Osceola	587.2	21.9	0.6	70.0	193.2	186.0	3.4	0.1	6.2	17.4	88.4	0.0
Palm Beach	1452.2	22.1	276.1	127.3	24.5	54.5	338.1	255.9	17.9	144.5	180.5	10.8
Polk	489.9	72.2	0.0	31.6	80.9	222.9	12.0	3.2	7.0	21.0	39.1	0.0
St. Lucie	303.4	58.7	0.9	44.8	79.3	60.7	9.0	0.2	6.5	24.5	2.4	16.4
Total	11305.2	345.5	437.4	1116.9	1948.5	1993.4	1394.4	1842.1	110.4	861.1	688.8	566.7

USDA Field Survey

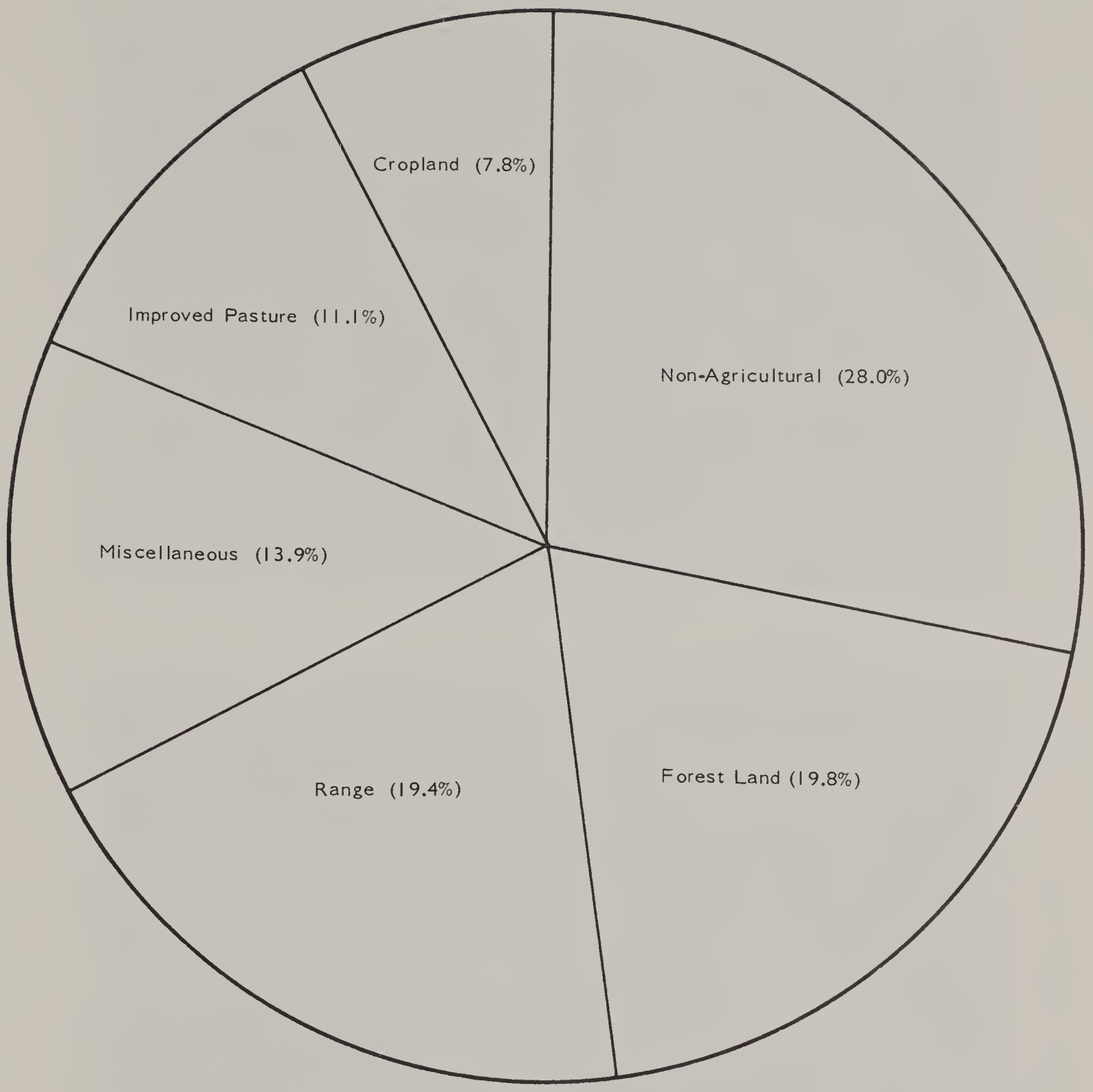

Figure 22

Land Use, Kissimmee-Everglades Area, 1968

4-30265 4-71
U. S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, GAINESVILLE, FLORIDA
USDA-SCS-FORT WORTH, TEX. 1971

MULTIPLE USE OF LAND AND WATER RESOURCES

4-31002 11-71

Citrus. Florida produces about 55 percent of the world's grapefruit and nearly one-fourth of the world's oranges. This percentage has been increasing slightly in recent years. In 1968, Florida produced 143 million boxes of citrus on 692,000 acres. This represents about 80 percent of the U. S. citrus production excluding lemons and limes.

Approximately 36 percent of the State's citrus production came from the Basin in 1968 (Table 2-16). Production in the Basin has increased from 35.1 million boxes in 1960 to 51.4 million boxes in 1968. Oranges have historically represented about two-thirds of total production. Total production has tended to vary considerably from year to year primarily due to weather conditions. Gross sales from Basin groves in 1968 were 106 million dollars. This consisted of 78 million dollars from oranges, 24 million from the sale of grapefruit and 4 million from tangerines and other citrus crops.

TABLE 2-16. Citrus production and share of State production, Kissimmee-Everglades Area, 1960, 1964 and 1968

	Basin production			Share of State production		
	1960	1964	1968	1960	1964	1968
	Million boxes			Percent		
Oranges[1/]	24.6	21.9	37.9	26.9	37.5	36.0
Grapefruit[2/]	9.9	9.8	12.2	37.5	37.1	37.1
Other Citrus	0.6	1.0	1.3	22.7	29.5	25.7
Total	35.1	32.7	51.4	28.2	37.0	36.0

Florida Crop and Livestock Reporting Service, U. S. Department of Agriculture, Citrus Summary, 1960, 1964 and 1968, Orlando, Florida.

1/ A box of Florida oranges weights 90 pounds
2/ A box of Florida grapefruit weights 85 pounds

Since the heavy freeze in December 1962, large acreages of citrus have been replanted in Florida both inside and outside the Basin. In 1968, 345,500 acres were used for citrus[1/]. Approximately 37 percent of this acreage has been planted since 1964. Citrus production is concentrated in the northern portion of the Basin (Figure 23). Polk, Highlands, and St. Lucie led all Basin counties in citrus production in 1968.

1/ USDA land use field survey - 1968

4-30265 5-73

Sugarcane. Imports of Cuban raw sugar were discontinued in the early sixties and as a result, large increases in U. S. sugarcane acreage and production have occurred. Florida and Louisiana produce all of the sugarcane grown in the continental U. S. All of Florida's sugar is produced in the Basin. Florida growers have historically produced more cane per acre and more sugar per ton than Louisiana.

Hawaii produced slightly more cane than the U. S. mainland in 1968 while Puerto Rico produced over half as much as the U.S. Hawaii grew about 60 percent as much sugar acreage as Florida, yet because of the high yields, produced over twice as much raw sugar as Florida (Table 2-17). However, despite the large differences in yields, the Basin's share of total U. S. production has increased from 6.5 percent in 1959 to 22.3 percent in 1968.

At the present time, most of the sugarcane is grown near Lake Okeechobee. The organic muck soils are well adapted to its production and the large body of water lessens the probability of frost damage. In 1968, the entire Florida sugar crop was grown in Glades, Hendry, Palm Beach and Martin counties by less than 200 producers. Gross sales of raw sugar in 1968 were 66 million dollars, ranking third in monetary value behind citrus and vegetables.

TABLE 2-17. Acreage, yield, quantity and value of production of sugarcane, and share of U. S. cane sugar production, Kissimmee-Everglades Area 1959, 1963 and 1968

Item	Unit	1959	1963	1968
Acreage harvested for sugar	1,000 acres	46.4	142.5	182.7
Sugarcane production	1,000 tons	1771	4446	5846
Yield of cane	Tons/acre	38.2	31.2	32.0
Yield of sugar	Pounds/ton-cane	198	191	205
Total sugarcane production	1,000 tons (raw value)	175	424	600
Share of U.S. production of cane sugar	Percent	6.5	13.7	22.3
Value of raw cane sugar production	Mil. dollars 1/	19.3	46.6	66.0

1/ 1968 dollars

Association of Sugar Producers of Puerto Rico, Manual of Sugar Statistics, Washington, D.C.

Agricultural Stabilization and Conservation Service, U. S. Department of Agriculture, Sugar Statistics and Related Data, Statistical Bulletin No. 244, Vol. II, Washington, D.C. Feb. 1969

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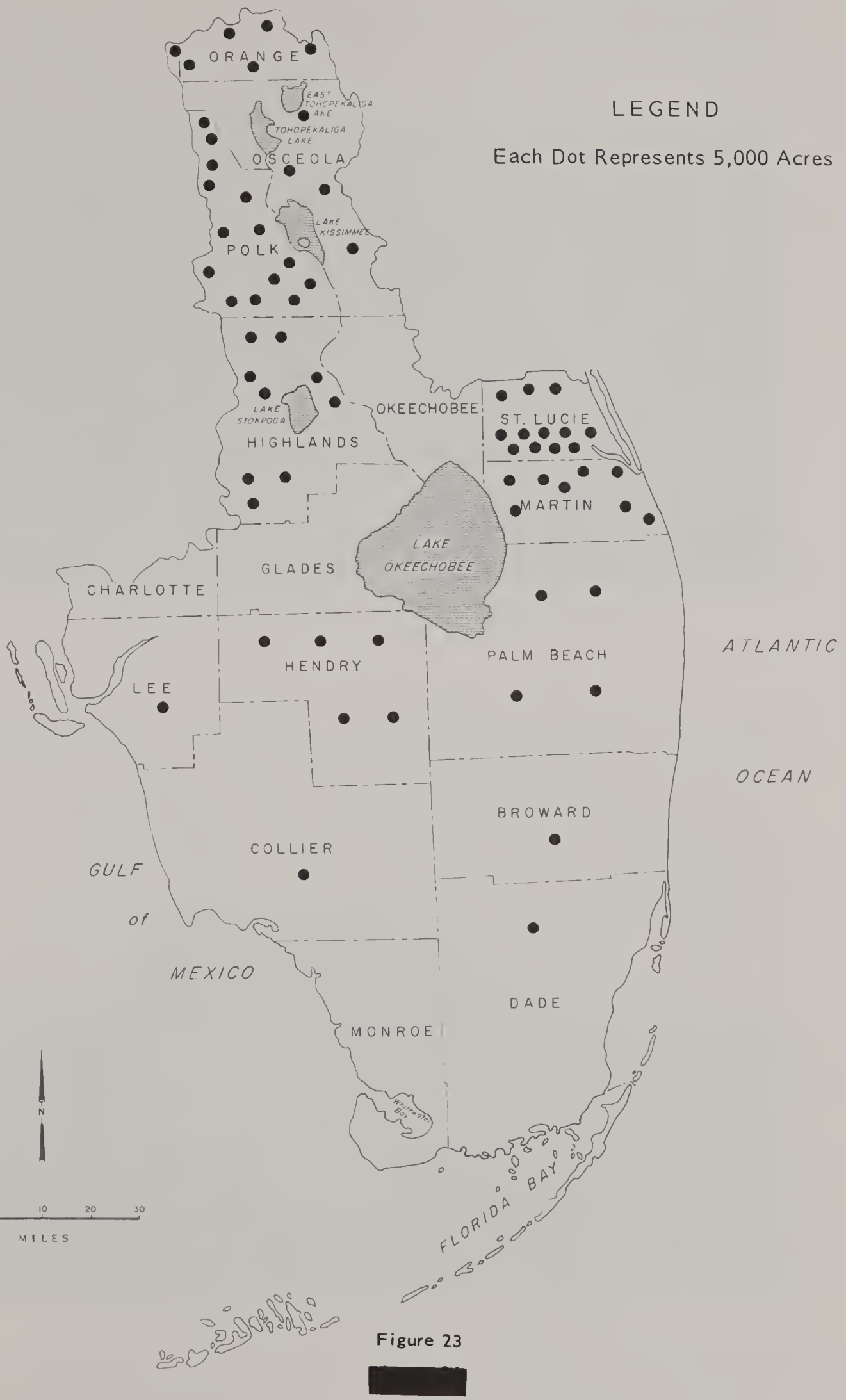
CITRUS ACREAGE BY COUNTIES
1968
Kissimmee–Everglades Area



LEGEND

Each Dot Represents 5,000 Acres

Figure 23

4–30265 5–71
U. S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, GAINESVILLE, FLORIDA
USDA-SCS-FORT WORTH, TEX. 1971

YOUNG FLORIDA SUGAR CANE ON ORGANIC SOIL

MECHANICAL LOADING OF SUGAR CANE

Photos courtesy Florida Sugar Cane League

4-31002 11-71

Vegetables. Approximately 210,400 acres of vegetables were grown in the Basin in 1968 (Table 2-18). This acreage produced over 2.3 billion pounds of vegetables which sold for $173.9 million. Tomato sales represented $57.1 million. Snap beans, sweet corn, green peppers and celery also contributed significantly to vegetable sales. Total acreage and production changed very little between 1963 and 1968 although acreages of individual crops tend to fluctuate from year to year depending on expected prices and weather conditions. Although vegetable acreage has been slowly increasing, the number of vegetable farms as reported by the Census of Agriculture declined from 725 in 1954 to 460 in 1964. This indicates that vegetable farmers are increasing the size of their farming operations.

TABLE 2-18. Acreage and production of vegetables, and share of State acreage, Kissimmee-Everglades Area, 1963 and 1968

Crop	Area planted		Production		Share of State acreage, 1968	Value of production 1968
	1963	1968	1963	1968		
	Acres		1000 cwt		Percent	1000 dol.
Cabbage	5,325	2,700	870	504	15.3	1,766
Cantaloupes	480	170	37	12	14.2	78
Celery	8,400	9,780	3,353	3,500	78.9	17,989
Cucumbers	9,785	10,220	867	1,127	58.4	7,382
Eggplant	1,800	1,330	278	235	60.4	2,273
Escarole	5,050	4,220	466	495	63.9	3,813
Green pepper	7,890	13,470	1,452	1,556	78.9	21,822
Irish potatoes	8,635	12,590	1,336	2,083	29.1	7,083
Lettuce	1,950	2,600	205	180	54.1	1,746
Limas	569	305	15	8	30.5	69
Melons	11,435	12,885	2,488	2,595	20.7	5,449
Snap beans	46,840	44,420	1,376	1,526	87.8	17,078
Squash	9,370	6,835	455	476	74.3	4,883
Strawberries	1,210	640	105	58	33.6	1,654
Sweet corn	47,550	49,630	3,275	3,214	83.4	19,606
Tomatoes	37,390	33,710	5,316	5,269	70.5	57,115
Other	4,852	4,895	521	544	-	4,094
Total or share	208,531	210,400	22,415	23,382	51.6	173,900

Florida Crop and Livestock Reporting Service, U.S. Department of Agriculture, Vegetable Summary, 1963 and 1968, Orlando, Fla.

4-30265 5-73

Palm Beach and Dade counties are the two major vegetable producing counties (Figure 24). These are areas where population has expanded rapidly and the non-agricultural demands for land have increased. Despite this, the share of State acreage has remained relatively constant at about 50-55 percent during recent years. More than 70 percent of Florida's snap beans, sweet corn, green pepper, squash, tomatoes, and celery acreage is grown in the Basin. The principal vegetable crops are produced mainly from late fall to early spring. The area is the nation's major producer of several vegetable crops during these seasons of the year. Almost all of the vegetables are sold for the fresh market.

Nursery and Greenhouse products. In 1968, Florida sold $88.8 million of nursery and greenhouse products which represented 7.2 percent of the value of all agricultural commodities sold. Turfgrass production in the State represented an additional $10.3 million. Nursery, flower, foliage and turf crops are not only an important part of Florida's agricultural production, but are essential also for the improvement of the aesthetic environment.

The Basin's share of Florida's sales from nursery and greenhouse products has increased from 35 percent in 1949 to almost 50 percent in 1968. Approximately 90 percent of the turf grown in the State in 1968 was produced in the Basin. Sales of nursery and greenhouse products represented $43.7 million in 1968. Approximately two-thirds of total sales were from flowers and plants. Sales of sod represented an additional $9.3 million. Approximately 6,500 acres of ornamentals, 450 acres of citrus stock and 14,500 acres of sod were being grown for resale in 1968. Dade, Martin, Lee and Palm Beach counties each had sales of nursery and greenhouse products in excess of $5.0 million.

Roughage. In 1968, there were 1.1 million acres of improved pasture and 1.9 million acres of range in the Basin. Yields of pasture and range could be greatly improved through recommended management practices. Declining fertilizer costs and improved varieties have made it easier to increase production. Lack of capital and quality management are factors tending to limit pasture improvement.

There has been a large increase in the acreage of grass-clover pasture in recent years. This is significant because the 1968 DARE Report estimated that the carrying capacity of grass-clover pasture averages about $1\frac{1}{2}$ acres per animal unit while unimproved pasture averages about 12 acres per animal unit.1/

1/ University of Florida, Institute of Food and Agricultural Sciences, "1969 DARE Report, Publication No. 7", Gainesville, Fla. October 1969. Operation DARE - "Developing Agricultural Resources Effectively" was initiated in 1964 as a framework for studying, planning and taking action on those problems confronting Florida agriculture that might limit its potential for further growth and development.

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VEGETABLE ACREAGE BY COUNTIES
1968
Kissimmee–Everglades Area

Figure 24

4–30265 5–71
U. S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, GAINESVILLE, FLORIDA
USDA-SCS-FORT WORTH, TEX. 1971

THE BASIN IS A MAJOR PRODUCER OF THE NATION'S WINTER VEGETABLES

4-31002 11-71

In 1964, there were approximately 19,600 acres of hay grown in the Basin. Average yields were 2.3 tons per acre, almost double the State average. Total hay production was 44,400 tons. A total of 5,200 acres of grass silage was grown in 1964, producing 59,800 tons.

The Basin has accounted for 30 to 35 percent of the State's beef production during the past 20 years. Approximately 600,000 head of beef cattle were on farms in 1968. Beef production in 1968 totaled 145 million pounds. The share of sales from beef is less than the share of beef cattle numbers. This indicates that the quality of beef produced here is even lower than in the remainder of the State. This is primarily due to the use of breeds that are more tolerant to the climatic conditions of the area.

Sales of beef in the Basin in 1968 were estimated to be $32.6 million. According to the 1964 Census of Agriculture, Hendry, Highlands, Okeechobee, Osceola and Palm Beach were the major beef producing counties (Figure 25). In that year, 263,000 cattle and calves were sold (Table 2-19). Sales from cattle and calves totaled $25.2 million, while sales from cattle alone represented $17.2 million.

TABLE 2-19. Number and sales of cattle on farms, and share of State totals, Kissimmee-Everglades Area, 1954, 1959, and 1964

Year	Cattle on farms January 1 1/		Cattle sold	
	Basin	Share of State cattle	Basin	Share of State sales
	Number	Percent	Number	Percent
1954	529,489	32.1	214,595	32.6
1959	520,900	34.7	225,469	34.0
1964	607,330	33.3	263,179	32.6

1/ Includes milk cows

U. S. Bureau of the Census, U. S. Census of Agriculture, 1954, 1959 and 1964, Washington, D.C.

Milk production in the Basin in 1968 totaled 592 million pounds. This was produced from 67,650 dairy cows which represented an average production of 8,750 lbs., slightly higher than the State average. Value of Basin dairy sales in 1968 was estimated to be 41.3 million dollars.

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In 1968, there were 116 commercial dairies in the Basin, compared with 160 ten years earlier. Whole milk sales increased 95 percent during 1954-1964 (Table 2-20). The share of State milk cow numbers has increased slightly during this period, but the percent of State dairy sales has declined slightly. Several dairies around Miami have moved to Okeechobee and surrounding counties where land prices and taxes are lower. Figure 26 shows the distribution of milk cows in the Basin by counties in 1964.

TABLE 2-20. Number of milk cows, sales of dairy products and whole milk, and share of State totals, Kissimmee-Everglades Area, 1954, 1959 and 1964

Basin	Unit	1954	1959	1964
Milk cows	Number	55,400	69,300	65,900
	Percent of State total	34.9	38.3	37.4
Dairy products sales	Thousand dollars[1/]	23,500	36,700	37,500
	Percent of State total	42.1	43.7	38.8
Whole milk sales	Million pounds	259	465	507
	Percent of State total	40.4	42.8	40.3

1/ 1968 dollars

U. S. Bureau of the Census, U. S. Census of Agriculture, 1954, 1959 and 1964, Washington, D.C.

Other Livestock and Poultry. Several other types of livestock and poultry are grown in the Basin. These include hogs, sheep, chickens and turkeys. With the exception of eggs, these enterprises were either very small or represent a small share of the State's production. Egg production has increased rapidly in past years, increasing from 4.0 million dozen in 1954 to 11.6 million dozen in 1964. Production is not concentrated in any one area, although several large producers are located in the Miami - Fort Lauderdale area. Egg sales in 1964 were valued at 3.5 million dollars. Sales still represent less than one percent of farm receipts.

Forestland Resource Use. The uses of forestland are combined in different ways by landowners according to their needs and desires to manage their land. Some choose to furnish goods and services, while others hold their land for speculation with little or no management. Ownership, land capability and the location of forestland are also important in determining its use.

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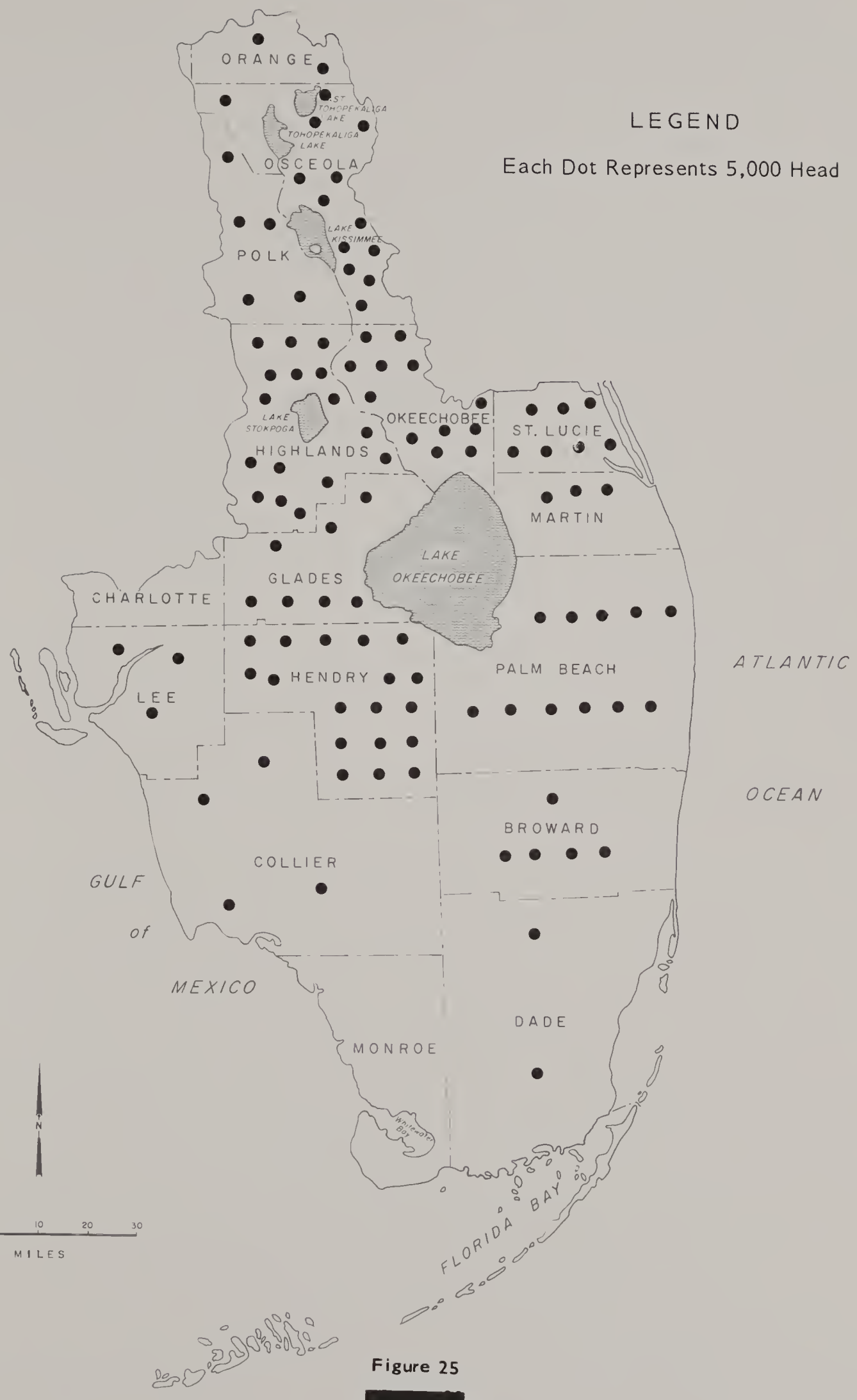
BEEF CATTLE BY COUNTIES
1964
Kissimmee–Everglades Area



LEGEND

Each Dot Represents 5,000 Head

Figure 25

4–30265 5–71
U. S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, GAINESVILLE, FLORIDA
USDA-SCS-FORT WORTH, TEX. 1971

MILK COWS BY COUNTIES
1964
Kissimmee–Everglades Area

LEGEND

Each Dot Represents 1,000 Cows

Figure 26

4–30265 5–71
U. S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, GAINESVILLE, FLORIDA
USDA-SCS-FORT WORTH, TEX. 1971

Commercial forestland used for the production of timber products is usually on the larger ownerships and areas owned or leased by corporations. On these lands, a forest management program is in effect and planned amounts of timber harvesting, site preparation and planting are done annually. Fire lines are constructed, and prescribed burning is done as needed to reduce the risk of a disastrous fire. The grazing of livestock is often combined with timber production as these uses are compatible where grazing is limited to the most productive areas of forage. Hunting and camping are permitted, often on a paid permit basis, which are added uses of the land. Other recreation uses, such as hiking, horseback riding and visiting the area to observe wildlife and birds are common, and without conflict.

The commercial forestland of small landowners often receives little attention before harvesting, other than constructing fire-breaks to reduce the risk from fire. Wood products are harvested from these areas and no provisions made to regenerate future timber crops. The cut-over areas grow up with undesirable brush or poorly stocked stands, having little value or use except for their soil-stabilizing qualities.

The forestland on wildlife areas is managed to achieve the best combinations of cover and food for wildlife. Prescribed burning is done periodically to reduce the understory vegetation, to improve hunter access, and lessen amounts of forest fuel. Planned periodic burning also improves the growing conditions for native grasses, resulting in more palatable forage. The grazing of livestock is often carried on in conjunction with wildlife use and considered compatible.

Grazing is confined to the larger blocks of forestland where areas of sufficient size for an operation can be fenced. Small scattered tracts adjacent to citrus groves and cropland are not well suited for this use. It is estimated that 70 percent of the forestland is grazed.

While many areas of forestland used mainly for recreation do not contribute to the production of wood products, they are invaluable to outdoor enthusiasts. State Parks, lakes and waterways owe much of their beauty and attractiveness to the forest cover of native vegetation. Beaches are enhanced by areas of shade. Attractive forest cover is a prerequisite for all developed recreation sites. Campers and picnickers are attracted to areas having some shade and protection from the wind. Nature and hiking trails seem more appealing in a woodland setting of quiet solitude.

4-30265 5-73

The important uses of the non-commercial forestland are hunting, sightseeing and other outdoor recreational activities. These lands are important areas for the propagation of game and support many species of animals and birds. The open scrub cypress forests, high hammocks in the Everglades and the Conservation Areas, the tree-covered coastal dunes, and tidal flats are the largest non-commercial forests.

The watershed protection afforded by forestland, with the associated recharge of groundwater, is important in water management. Forest cover, whether commercial or non-commercial, increases the infiltration and percolation rates of the soil and aids in improving water quality by building up leaf litter, which stabilizes the soil, therefore reducing sedimentation. The beneficial environmental effects and natural beauty provided by forestland may in many cases be its most important uses. These and other non-timber values of forestland are important to members of our society, both rural and urban. More consideration is being given to open space by the planners of future cities. Planners estimate that 33 to 40 percent of the total land in a development area should remain as open space.

Major Forest Industries

The forest-based industries include fourteen sawmills and three wood-treating plants (Figure 27). The capital investment in these primary wood-using industries is estimated to be $1.2 million.

Forest Type, Forestland Ownership, Site Class, Stocking, Volume and Growth

The distribution of the major forest types are shown on Figure 28. These types consist of 49 percent pine, 5 percent oak-pine and 46 percent hardwood (Figure 29, bottom).

Seventy percent of the commercial forestland is in miscellaneous private ownership, of which 49 percent is in corporate holdings and 21 percent is owned by individuals. Farmers own 21 percent of the remainder and 9 percent is in public ownership. Two-thirds of the public land is in Federal holdings and the remainder is in State, County and Municipal ownerships (Figure 29, top). There are no national or State forests in the Basin.

Forestland is classified according to its inherent capacity to grow crops of industrial wood based on fully stocked natural stands. The range of expected production capacity in terms of cubic feet per acre per year is expressed as site class. The commercial forestland occurs in site classes 3, 4 and 5 with capacities of 85 to 119, 50 to 84 and less than 50 cubic feet respectively[1/]. Two percent is in site class 3, and the remainder is almost evenly divided between site classes 4 and 5 (Figure 30, top).

1/ "Forest Survey 1970", Southeastern Forest Experiment Station, Asheville, N.C.

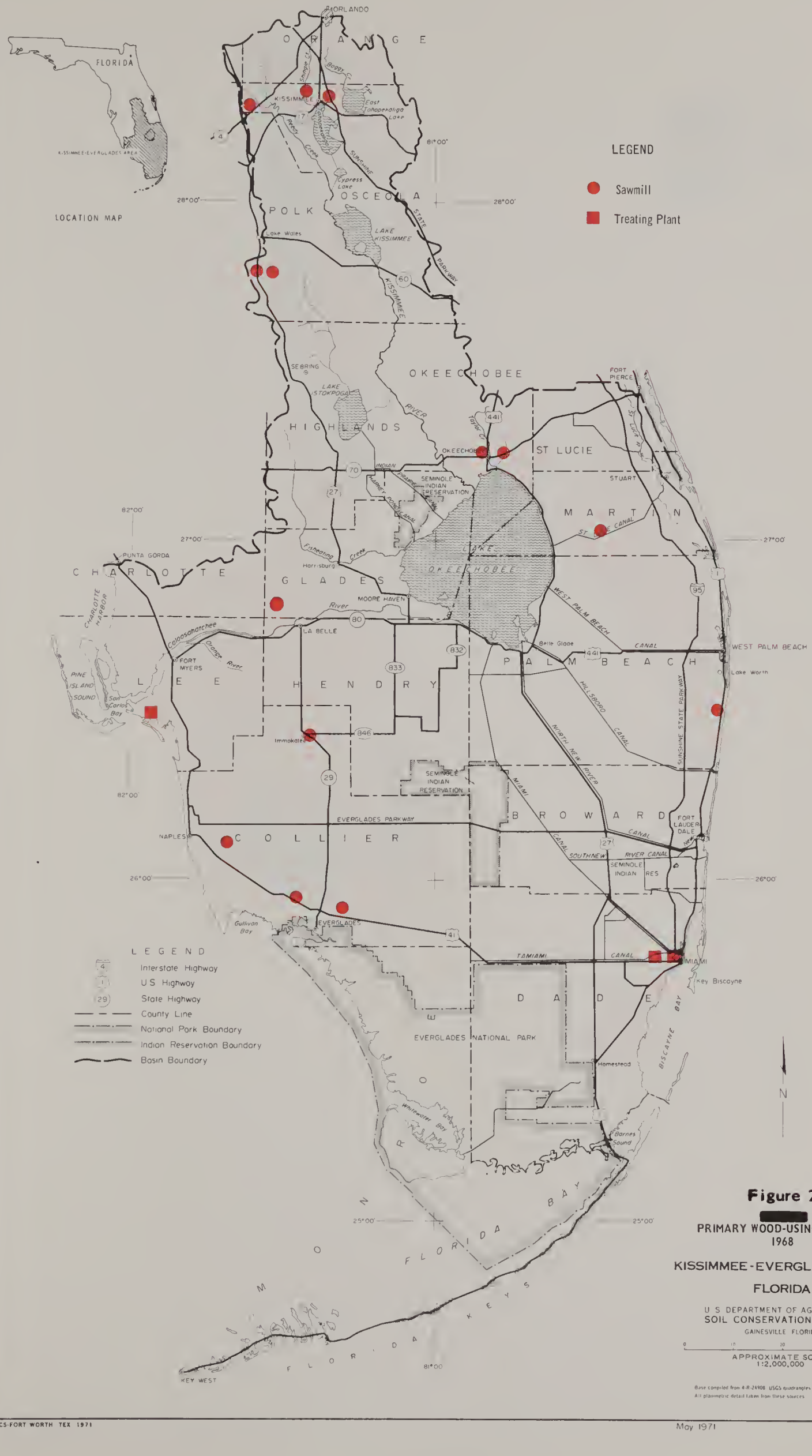


Figure 27

PRIMARY WOOD-USING PLANTS
1968

KISSIMMEE-EVERGLADES AREA

FLORIDA

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
GAINESVILLE FLORIDA

APPROXIMATE SCALE
1:2,000,000

Base compiled from 4-R-24908 USGS quadrangles and county highway maps
All planimetric detail taken from these sources

5-71 4-R-30,473

USDA SCS-FORT WORTH TEX 1971

May 1971

4-R-24908-A

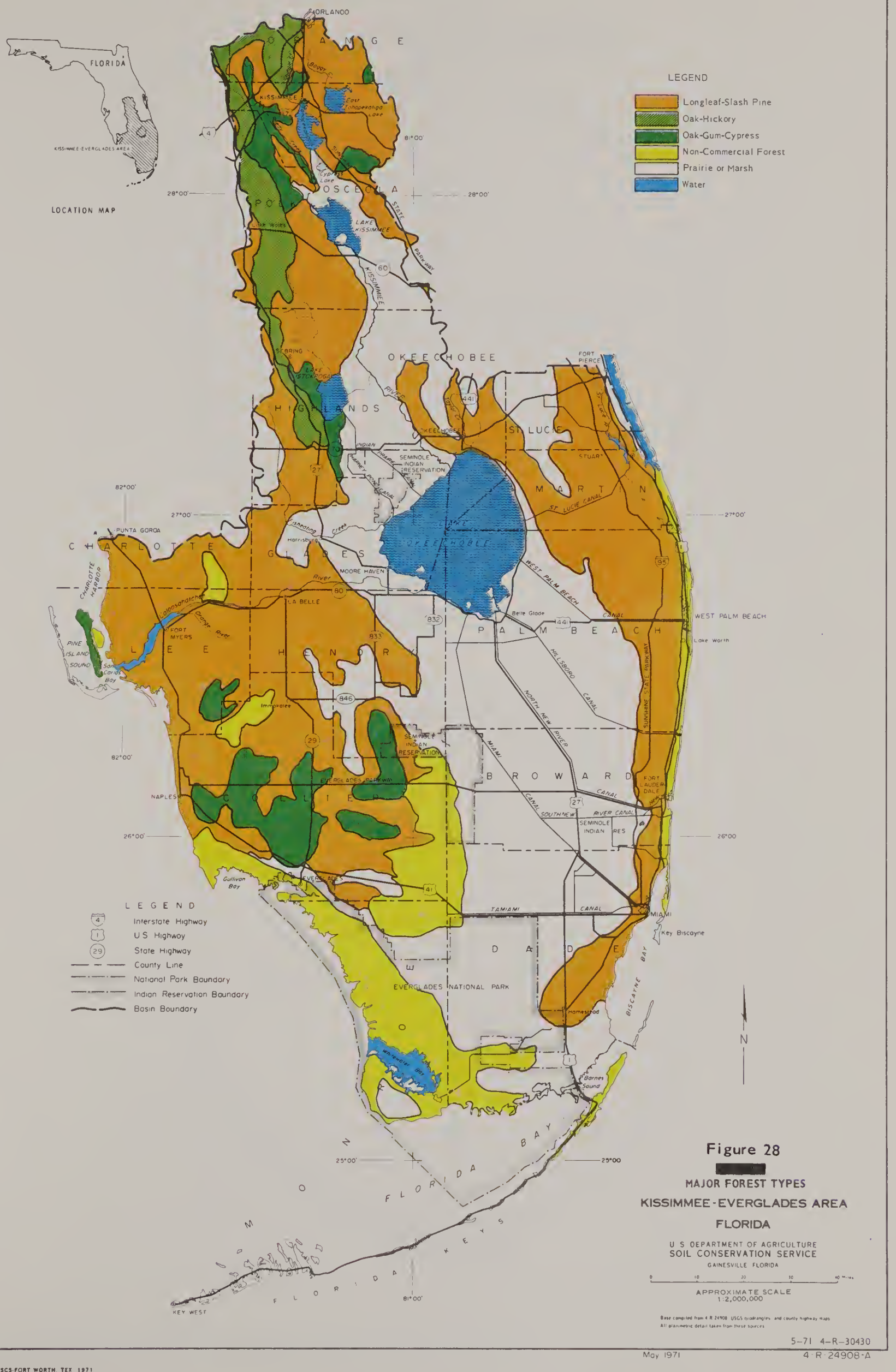


Figure 28

MAJOR FOREST TYPES
KISSIMMEE-EVERGLADES AREA
FLORIDA

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
GAINESVILLE FLORIDA

0 10 20 30 40 Miles

APPROXIMATE SCALE
1:2,000,000

Base compiled from 4 R 24908 USGS quadrangles and county highway maps
All planimetric detail taken from these sources

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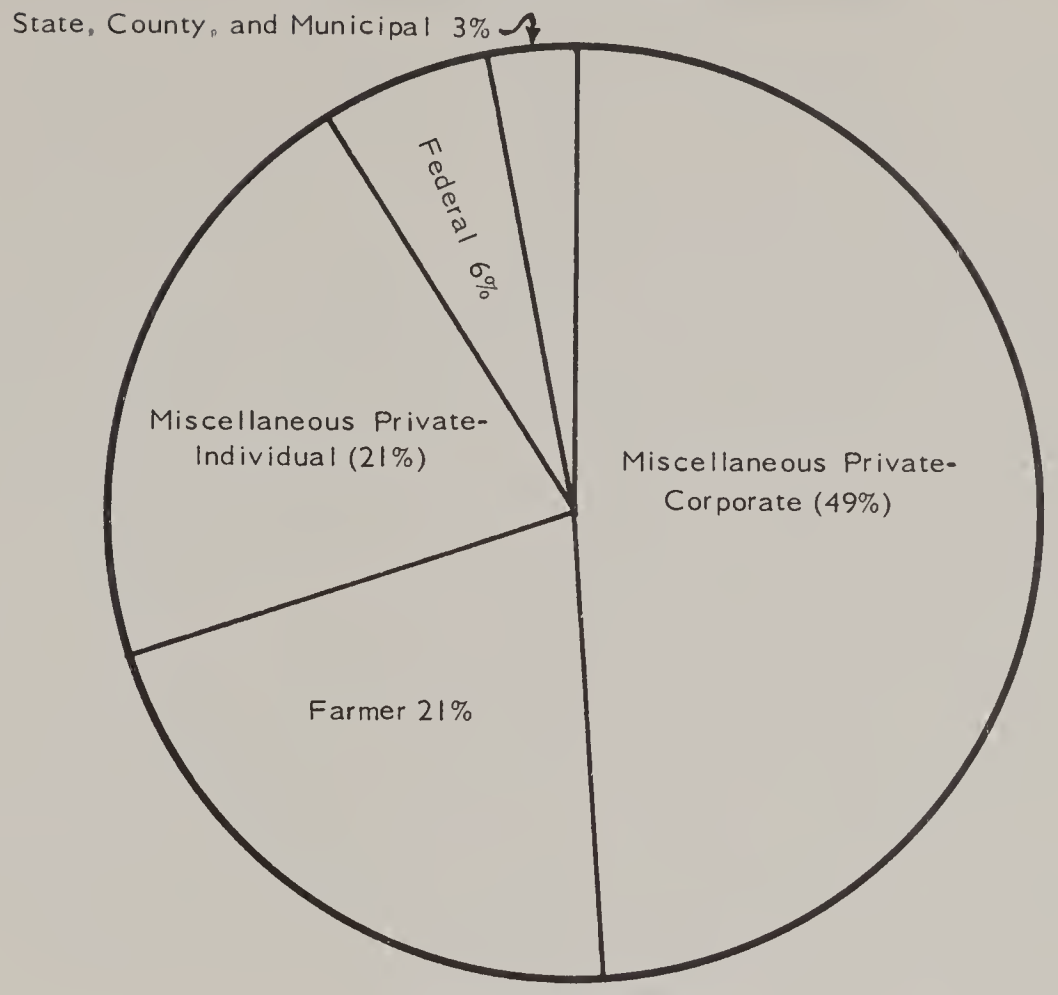
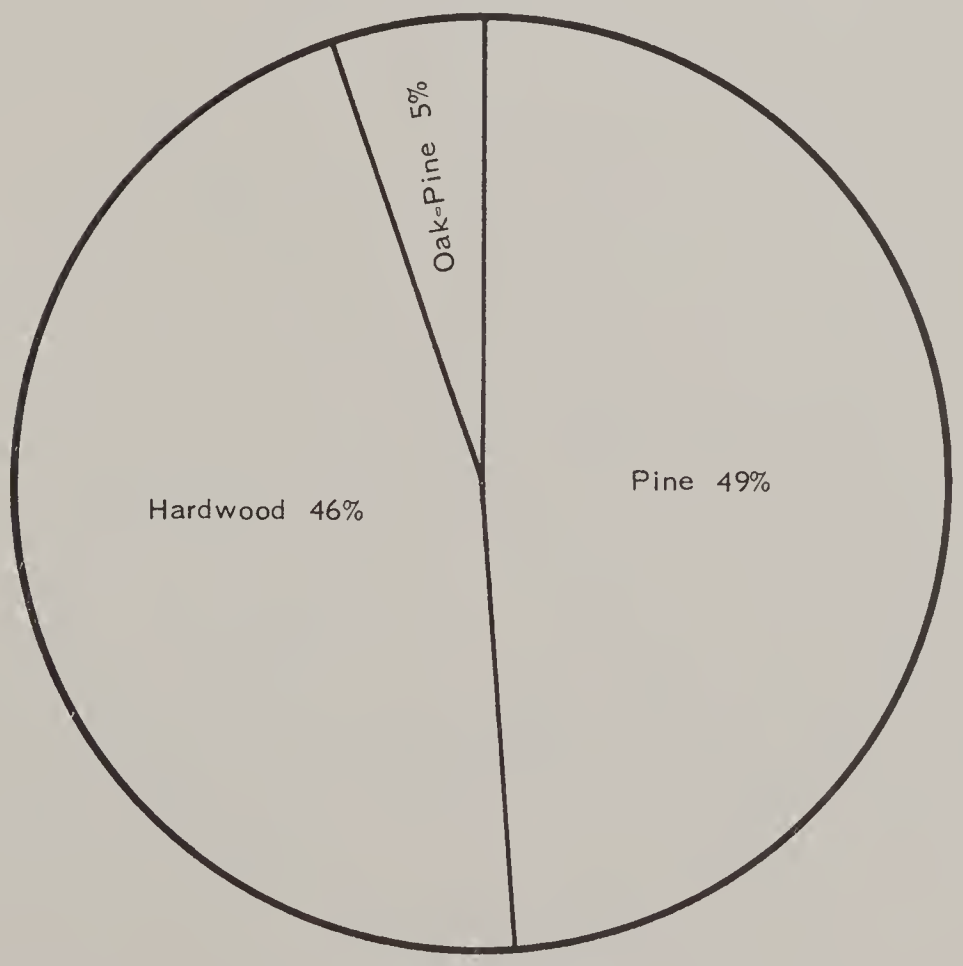
USDA-SCS-FORT WORTH, TEX 1971

Figure 29

COMMERCIAL FOREST LAND
1968
KISSIMMEE-EVERGLADES AREA



LAND OWNERSHIP



FOREST TYPE

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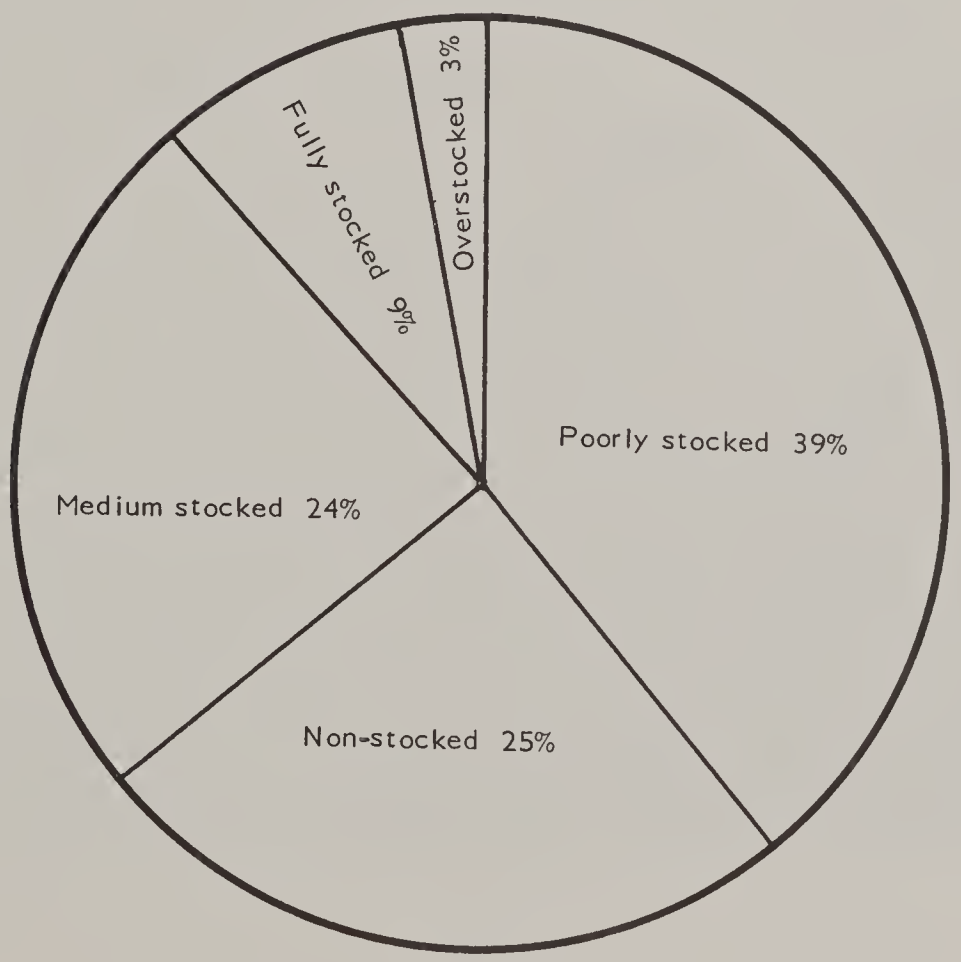
Figure 30

COMMERCIAL FOREST LAND
1968
KISSIMMEE-EVERGLADES AREA

SITE CLASS



STOCKING

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WELL MANAGED NATIVE GRASSES SUPPLY LARGE QUANTITIES OF FORAGE

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FORESTS ADD TO THE ENJOYMENT OF RECREATION AREAS

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Stocking is the degree of occupancy of forestland by trees, expressed in percent[1/]. Two-thirds of the commercial forestland acreage is less than fully stocked and three percent is overstocked (Figure 30 - bottom).

The total volume of growing stock is estimated to be 685.2 million cubic feet, of which 47 percent is sawtimber, the remainder being pulpwood and other products. The volume by species groups is shown on Figure 31 (top). Seventy-nine percent of the growing stock is softwood and 21 percent is hardwood. The average volume of growing stock per acre is 576 cubic feet.

The total net annual growth of growing stock is 21.7 million cubic feet, consisting of an estimated 62 percent sawtimber and 38 percent other products. The growth by species groups is shown on Figure 31 (bottom). The average net annual growth is 18.3 cubic feet per acre, which is estimated to be 40 percent of the potential growth that could be achieved by 1980 under intensive forest management.

Projected Agricultural Conditions

Potential Agricultural Problems

Basin farmers face many problems which make projections of future production and resource needs difficult. The projections made in this study are made under the assumption that these conditions will not be limiting factors. However, it should be realized that some conditions or combinations of situations may limit production of specific commodities. If conditions restrict the production of one commodity it would be realistic, especially in the major agricultural areas, to assume that the production of similar commodities would increase. For example, if government policies restrict the acreage of sugarcane, the Basin's share of vegetable production could be expected to increase. Although limiting factors cannot be accurately projected, it is important to recognize potential problem areas.

The major difficulties facing citrus producers today concern labor problems and over-production. During the last ten years, costs of picking oranges have increased from 33¢ to 54¢ per box, while prices have declined slightly. The increase in costs has been largely the result of government labor policies and the competing opportunities for unskilled workers. Utilization of off-shore labor has been virtually eliminated except

1/Overstocked-Over 130 percent
Fully stocked-100 to 129 percent
Medium stocked-60 to 99 percent
Poorly stocked-16.7 to 59 percent
Nonstocked-Less than 16.7 percent

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for brief periods. The uncertainties associated with the use of seasonal labor have increased as unemployment rates in the citrus areas have become very low. Complete mechanization is not foreseen in the immediate future and its introduction is limited by its cost which has been estimated to range from $30,000 to $100,000 per harvesting crew. Future over-production may depress prices to the extent that growers will reduce production and bring demand and supply into equilibrium.

The future of the sugarcane industry in Florida is uncertain. Cane producers face problems similar to citrus producers with regard to labor. Increased mechanization, especially in harvesting, is needed to reduce labor costs. The magnitude of sugarcane production will be affected by the rate of muck subsidence south of Lake Okeechobee. If the organic muck depletes faster than is anticipated, it may be necessary for production to shift to nearby areas. This will depend on the development of new varieties adapted to colder conditions and mineral soils.

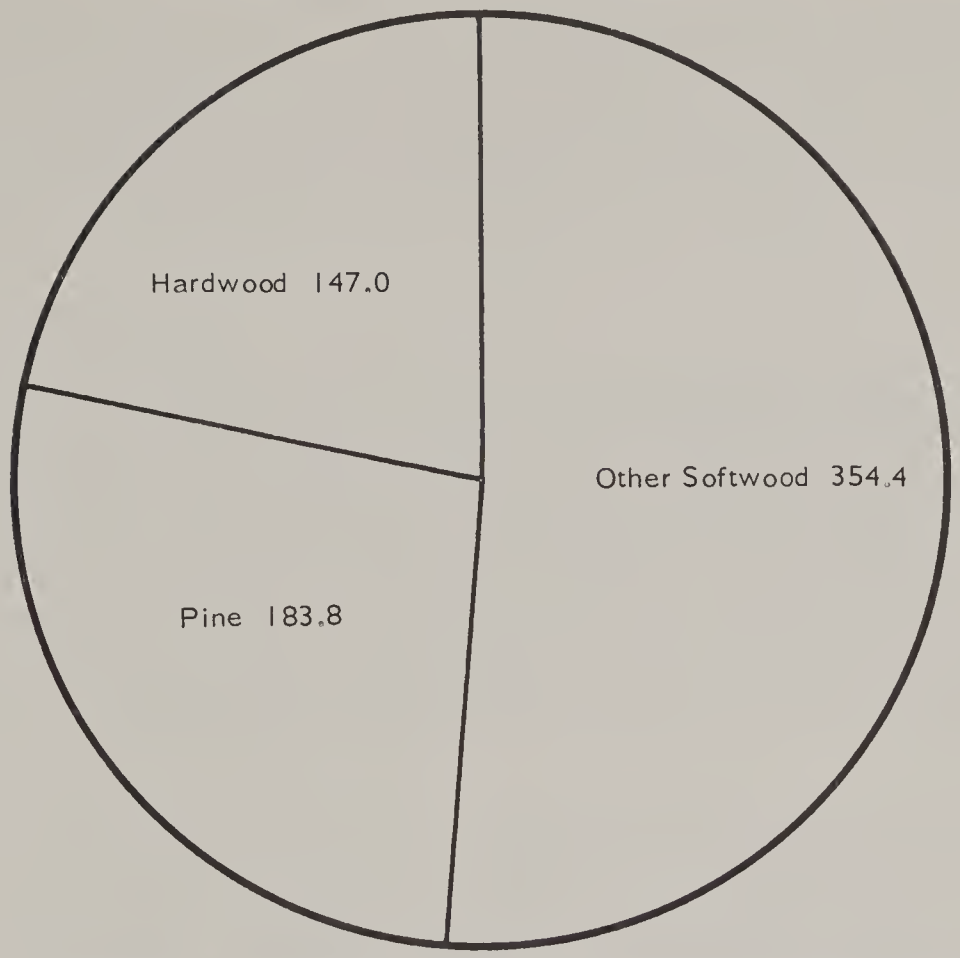
Vegetable production is located in the southern part of the Basin where the largest growth in population is expected. Much of the mineral soils desirable for vegetable production are also wanted for houses, sub-divisions, and industrial development. Vegetables require large amounts of seasonal labor and face many of the same problems associated with citrus and sugarcane. Much of the labor used is migrant labor which has been receiving considerable attention. Employers of migrant workers may be required to improve wages, housing, length of employment, and overall conditions for these workers in the future. Attacks on the vegetable industry regarding air and water pollution are expected to intensify in the future. Materials that can possibly contaminate water supplies will not be available for agricultural use. Damage to vegetables may result from flourides, sulphur dioxides, and similar materials produced by increasing industrialization in the area.

Livestock producers face some of the same pollution, labor and pesticide problems faced by crop producers, although in most cases to a lesser degree. Government policies regarding such things as imports of livestock and livestock products, farm loans, interest rates, marketing quotas, etc., have important implications for the livestock industry. Animal waste disposal systems are generally unsatisfactory and will become more expensive with the advent of more stringent anti-pollution laws. Increasing land values and taxation may shift the location of production. Improvements in technology and transportation till force Basin producers to become more efficient in order to meet competition from major livestock-producing areas.

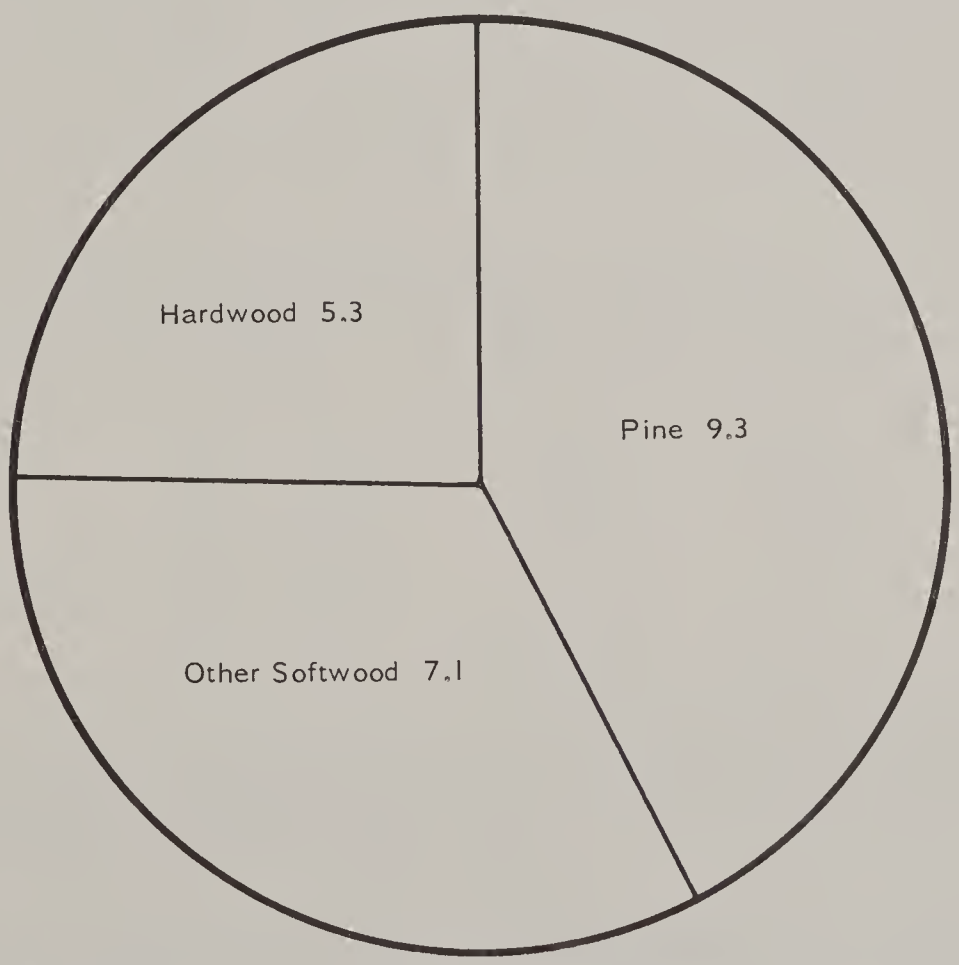
Most of these problems, except muck subsidence, will be faced by all U.S. producers of similar products. However, agricultural production in Florida is probably more sensitive to world market conditions than it is in other parts of the country. Producers of non-perishable commodities such as sugarcane will be affected

Figure 31

COMMERCIAL FOREST LAND
1968
KISSIMMEE-EVERGLADES AREA



VOLUME, GROWING STOCK–MILLION CUBIC FEET



NET ANNUAL GROWTH, GROWING STOCK–MILLION CUBIC FEET

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more than producers of perishable commodities such as winter vegetables. The severity and extent of the problems will certainly have an effect on prices and future location of production. However, Florida producers are expected to be able to compete effectively with other U. S. growers.

Agricultural Production

Future production estimates in the Kissimmee-Everglades Area were based on historical production, land availability and national production estimates. National projections are based on per capita utilization rates, livestock feeding efficiency, industrial uses, imports and foreign market requirements. The national production estimates used in this study are shown in Table 2-21 and production projections for the Basin are shown in Table 2-22. (Acreages required to meet these projections will be discussed in Chapter 4).

During the course of this study, the Water Resources Council published for review on April 15, 1971, a revised set of national production estimates. These projections for 2020 were significantly lower for sugarcane than those originally used in this study. Other commodities were changed enough that it was felt worthwhile to base the remainder of the planning effort for 2020 on the later estimates. At the time the latter projections were published, considerable use had been made of the 1980 projections published in August 1967 and revised to Series C population estimates in April 1968. Since the latter national projections for 1980 were not substantially different for commodities produced in the Basin, no attempt was made to revise the Basin projections.

TABLE 2-21. Projected production of agricultural commodities, United States, 1959-1961, 1980 and 2020

Commodity	Unit	1959-61 1/	1980 1/	2020 2/
Beef and veal	Bil. lbs.	28.9	45.5	94.3
Milk	Bil. lbs.	123.5	139.4	169.0
Citrus	Mil. tons	8.0	11.0	29.3
Raw cane sugar 3/	Mil. tons	.7	2.1	2.1
Vegetables	Mil. cwt.	403.9	615.9	911.0

1/ U.S. Department of Agriculture, Preliminary Projections of Economic Activity in the Agricultural, Forestry and Related Economic Sections of the United States and its Water Resource Regions, Washington, D.C. August 1967.

2/ U.S. Water Resources Council, Economic Activity in the United States by Water Resources Regions and Sub-Areas, Historical and Projected 1929-2020. (For review, projected data not final), Washington, D.C. April 1971

3/ Includes only mainland cane because original projections for 1980 did not include Hawaii.

TABLE 2-22. Production of major agricultural commodities - Kissimmee-Everglades Area - 1968, 1980 and 2020

Commodity	Unit	1968	1980	2020
Grapefruit	Million boxes	12.2	17.0	27.2
Oranges 1/	Million boxes	39.2	72.0	114.8
Vegetables	Million cwt	23.4	40.8	60.5
Sugarcane	Million cwt	12.0	20.0	19.5
Beef	Million pounds	145	270	600
Milk	Million pounds	592	700	1400

1/ Includes other citrus

Value of Farm Sales

Farm sales were projected on the basis of projected production using adjusted normalized prices for the major commodities.1/ Sales of nursery products were projected on the basis of trends reported in the Census of Agriculture from 1949 to 1964, DARE projections, and population projections. The value of all farm sales is expected to increase from $405.6 million in 1968 to $667.6 million in 1980. Sales should exceed one billion dollars by 2020 (Table 2-23).

Vegetables are projected to represent the largest share of total receipts in each target year. Sales of vegetables are expected to increase from $161.5 million in 1968 to $281.5 million in 1980. Citrus sales are expected to reach $116.5 million by 1980. Sales of all commodities in each target year are expected to retain about their same share of total receipts as in 1968. Figure 32 shows the expected distribution of total farm sales in 1980.

1/ Adjusted normalized prices are computed by mathematically fitting a trend line to remove year to year fluctuations caused by weather or other short term disturbances. These prices are then adjusted to remove the direct effects of government programs involving price supports or payments. See Interim Price Standards for Planning and Evaluating Water and Land Resources issued by the Interdepartmental Staff Committee of the Water Resources Council in April 1966.

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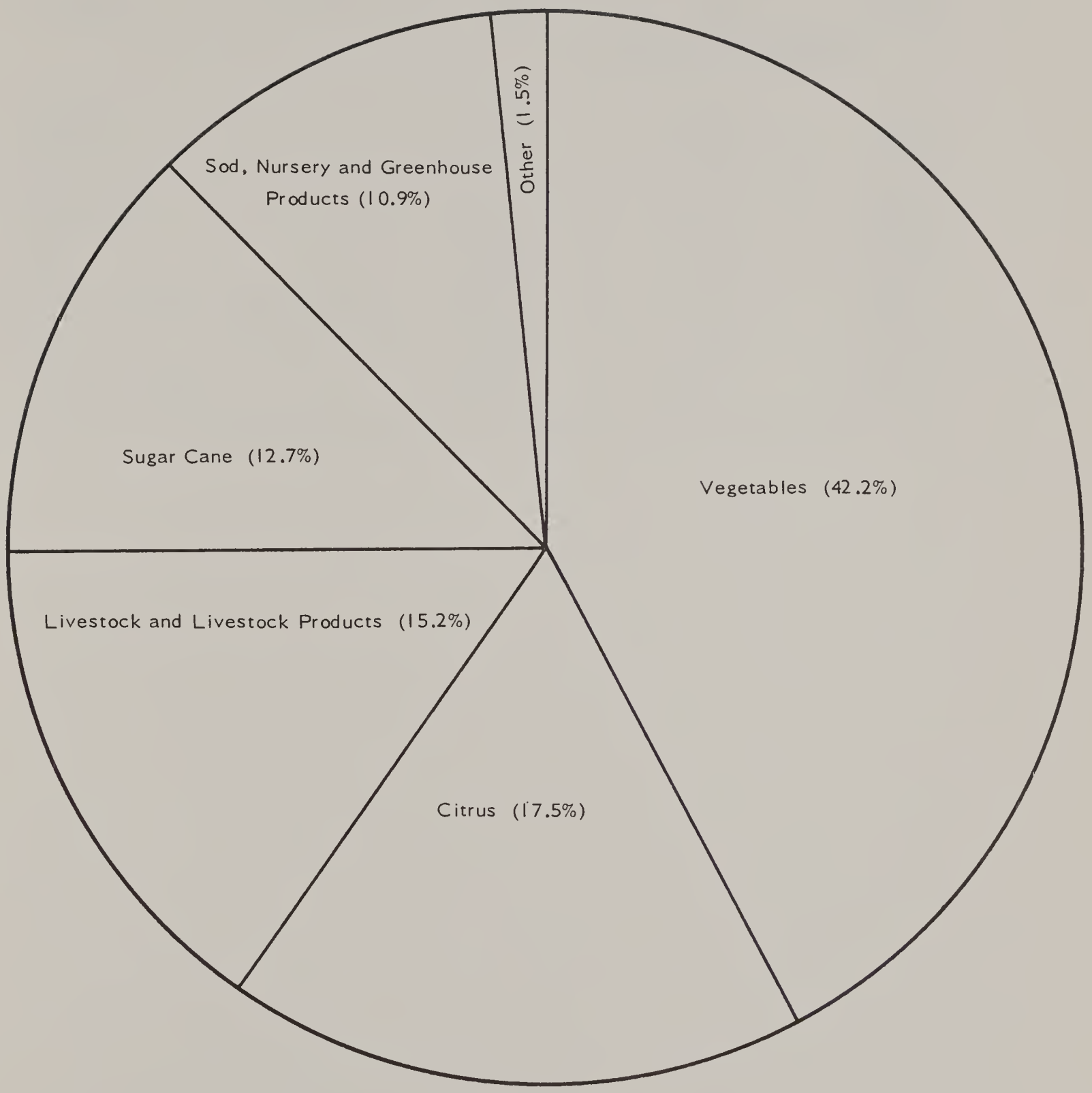

Figure 32

Distribution of Farm Sales, Kissimmee-Everglades Area, 1980

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TABLE 2-23. Value of farm sales, Kissimmee-Everglades Area, 1968, 1980, and 2020 (Adjusted Normalized Prices)

Item	1968	1980	2020
		Million dollars	
Grapefruit	18.5	25.8	41.3
Oranges	47.8	84.4	134.5
Other Citrus	2.0	6.3	12.2
Vegetables	161.5	281.5	417.5
Sugarcane	51.0	85.0	82.9
Beef	29.3	54.6	121.4
Dairy	39.8	47.0	94.1
Sod, nursery & greenhouse	47.7	73.1	144.5
Other	8.0	9.9	12.2
Total Value	405.6	667.6	1060.6

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S E C T I O N I I I

WATER AND LAND RESOURCE PROBLEMS

The complexity of problems involved with land and water resource use and development is greater in the Kissimmee-Everglades Area than in any other portion of the State. The tremendous influx of new residents and visitors, with their associated demand for additional goods and services, puts additional pressures on the natural resources of the area, which are also needed to produce agricultural commodities to supply local and national markets. The orderly expansion of residential, industrial, agricultural, forestry, wildlife and recreational enterprises, involves the solution of problems associated with watershed protection, flood prevention and agricultural water management.

Land Resource Problems

Excess Water Damage

Agricultural Land. Most of the soils of the Basin have excess water hazards (Figure 33). An appraisal of the soil capabilities of the Basin, based on 1968 inventory data indicates that 96 percent of the 7.24 million acres classified as agricultural has excess water as the primary or secondary hazard (Table 3.1 and Figure 34). This percentage will remain almost constant in the future according to land use projections made for the Basin. Of the land used for crops and improved pastures in 1968, 92 percent consists of soils having excess water hazards. This should increase to approximately 96 percent by 2020 as the use of the better drained soils shifts from agricultural to non-agricultural and more areas with excess water hazards are brought into crop and pasture usage.

The appraisal of lands with water hazards was based on soil properties under natural conditions. Some treatment practices have been installed in many areas to control the water problems, but the problems remain inherent. The presence of an excess water hazard does not necessarily indicate the need for improved drainage for all uses. Some relatively wet soils may be producing excellent growth of native range or timber, but would

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require improved drainage for production of more intensive crops such as pasture, vegetables, or citrus. The efficient expansion of these more intensive uses to new areas, and the continued use in present locations depend upon solutions to problems caused by excess water. In order for water control measures to remain effective for proper removal of excess water, a continuous maintenance program is necessary.

TABLE 3-1. Agricultural lands having excess water hazards, Kissimmee-Everglades Area, 1968, 1980 and 2020

Item	1968		1980		2020	
	Mil. Acres	Percent	Mil. Acres	Percent	Mil. Acres	Percent
Crops and improved pasture	1.90	100.0	1.96	100.0	2.52	100.0
With excess water hazard	1.74	91.6	1.82	92.9	2.43	96.4
Range, forest & miscellan.	5.34	100.0	5.09	100.0	3.41	100.0
With excess water hazard	5.22	97.8	4.97	97.6	3.34	97.9
All agricultural land	7.24	100.0	7.05	100.0	5.98	100.0
With excess water hazard	6.96	96.1	6.79	96.3	5.82	97.3

Almost 400,000 acres of the forestland soils need some degree of surface water management. The potential productivity for pine is high on most of these soils with adequate water control, but productivity is low and equipment limitations, plant competition, and seedling mortality are severe without it.

Unsurfaced roads are often damaged by the overland flow of water from agricultural areas, including forestland, where natural or man-made waterways do not have sufficient capacity to contain this flow within banks.

Damages caused by excess water are due to high intensity rainfall and overland flow, as well as to excess moisture in the soil profile under normal conditions. Often these problems occur on areas too extensive for individual landowners to solve. Needed water management facilities may extend a considerable distance downstream from his property.

Most of the land surface of the Basin is relatively flat with poorly defined natural drainageways, interspersed with intermittent ponded areas and sloughs. During periods of high intensity rainfall, or rains of long duration, the water courses and ponded

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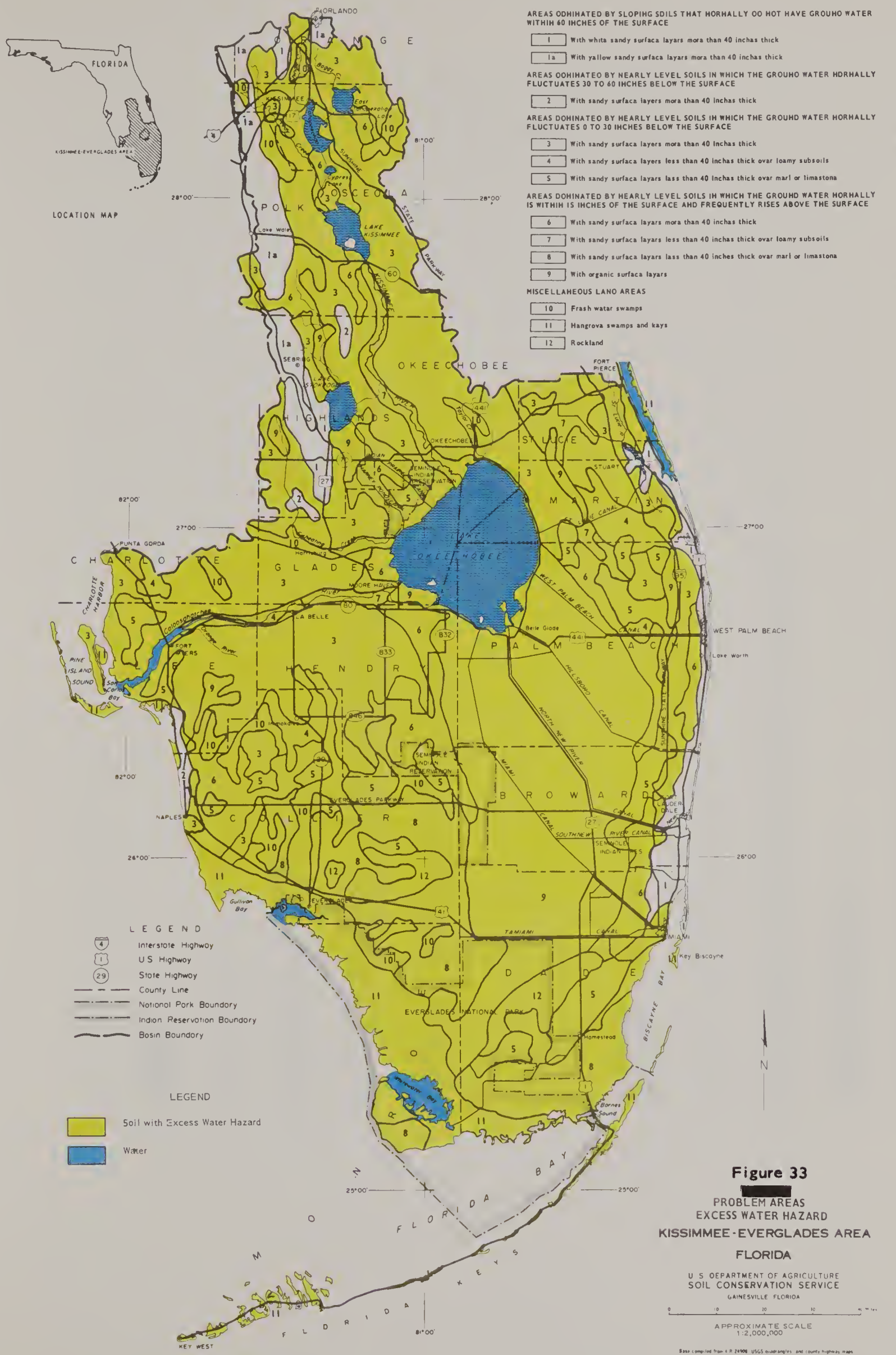
LEGEND
AREAS DOHINATED BY SLOPING SOILS THAT HORHALLY OO HOT HAVE GROUHO WATER WITHIN 60 INCHES OF THE SURFACE
1 With whita sandy surfaca layars mora than 40 inchas thick
1a With yallow sandy surfaca layars mora than 40 inchas thick
AREAS OOHINATED BY NEARLY LEVEL SOILS IN WHICH THE GROUHO WATER HORHALLY FLUCTUATES 30 TO 60 INCHES BELOW THE SURFACE
2 With sandy surfaca layers mora than 40 inchas thick
AREAS DOHINATED BY HEARLY LEVEL SOILS IH WHICH THE GROUHD WATER HORHALLY FLUCTUATES 0 TO 30 IHCHES BELOW THE SURFACE
3 With sandy surfaca layers mora than 40 inchas thick
4 With sandy surfaca layers less than 40 inchas thick ovar loamy subsoils
5 With sandy surfaca layars lass than 40 inchas thick ovar marl or limastona
AREAS DOHINATED BY HEARLY LEVEL SOILS IH WHICH THE GROUHD WATER HORHALLY IS WITHIH IS IHCHES OF THE SURFACE AHD FREQUENTLY RISES ABOVE THE SURFACE
6 With sandy surfaca layars mora than 40 inchas thick
7 With sandy surfaca layars less than 40 inchas thick ovar loamy subsoils
8 With sandy surfaca layars lass than 40 inches thick ovar marl or limastona
9 With organic surfaca layars
MISCELLAHEOUS LAHD AREAS
10 Frash watar swamps
11 Hangrova swamps and kays
12 Rockland
FLORIDA
KISSIMMEE-EVERGLADES AREA
LOCATION MAP
ORLANDO
ORANGE
OSCEOLA
POLK
HIGHLANDS
OKEECHOBEE
ST LUCIE
MARTIN
PALM BEACH
BROWARD
DADE
COLLIER
HENDRY
GLADES
CHARLOTTE
LEE
LAKE KISSIMMEE
LAKE OKEECHOBEE
EVERGLADES NATIONAL PARK
FORT PIERCE
STUART
WEST PALM BEACH
Lake Worth
PUNTA GORDA
LA BELLE
NAPLES
Homestead
Key Biscayne
MIAMI
KEY WEST
FLORIDA BAY
BISCAYNE BAY
Gullivan Bay
Barnes Sound
Lake Worth
SEMINOLE INDIAN RESERVATION
81°00'
82°00'
27°00'
28°00'
26°00'
25°00'
LEGEND
Interstate Highway
US Highway
State Highway
County Line
National Park Boundary
Indian Reservation Boundary
Basin Boundary
LEGEND
Soil with Excess Water Hazard
Water
N
Figure 33
PROBLEM AREAS
EXCESS WATER HAZARD
KISSIMMEE-EVERGLADES AREA
FLORIDA
U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
GAINESVILLE FLORIDA
APPROXIMATE SCALE
1:2,000,000
6-71 4-R-30570
USDA SCS-FORT WORTH, TEX 1971
May 1971
5-71 4-R-30391

Use of Soils Subject to Excess Water Hazard

Kissimmee-Everglades Area

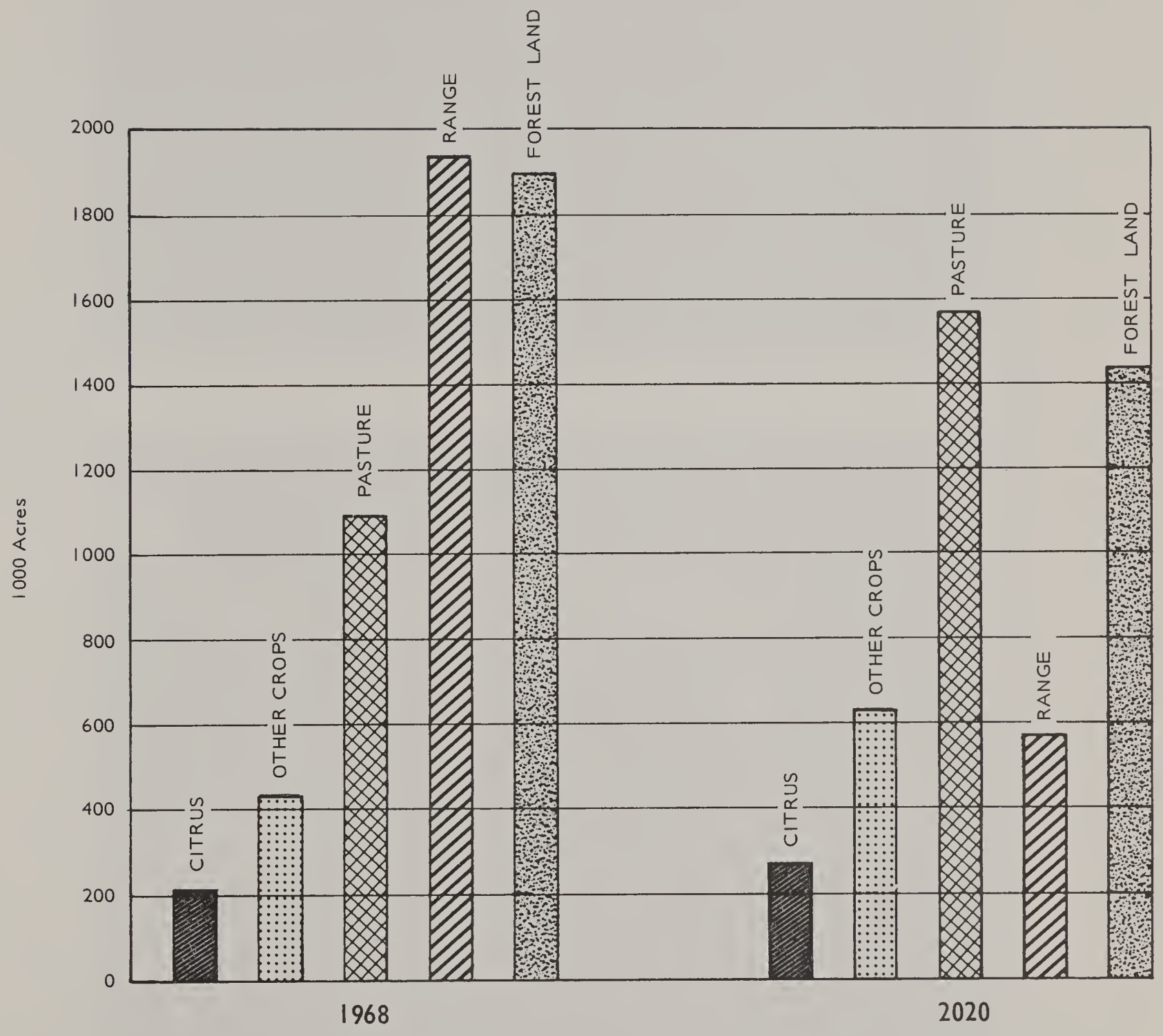

Figure 34

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FLOODS CAUSE DAMAGE TO BOTH RURAL AND URBAN AREAS

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ROADS ARE INUNDATED AND SOMETIMES CLOSED DUE TO FLOODS

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areas are filled to capacity, and floodwater spreads over adjacent lands. The natural surface removal rate is extremely slow, and although inundation is usually shallow, the long duration of flooding causes extensive damage to crops and improved pasture.

In addition to the detrimental effect of flooding or impaired drainage on yields of crops and pasture, interruptions in the land preparation, planting, and harvesting schedules have serious consequences for producers of sugarcane and vegetables. Flooding of cane lands during planting or growing seasons causes delays in harvesting which, in turn disrupts operations of the sugar mills. This results in added expense due to idle labor, equipment and processing plants.

In the case of vegetables, delays caused by flooding may be disastrous to the grower. The South Florida vegetable area is in production mainly during the winter season - a time when other producing areas of the country are idle. If Florida vegetables are delayed in reaching national markets, competition from other producers further north may cause prices for the Florida product to be depressed to the point that it cannot be economically marketed.

A large number of low income migrant workers are employed in various agricultural operations, especially in the harvesting of vegetables. Prolonged delays in harvesting are not uncommon, caused by flooding, droughts, or cold weather. These delays place serious financial burdens on these people who move into the area with almost no material possessions and depend solely upon agricultural employment while in the area. The grower, as well as the community is then faced with the responsibility of providing for the needs of the migrant families until employment is available.

The lands that suffer from flooding and inadequate drainage during the rainy season of June through September are also seriously affected by droughts during periods of low rainfall. Therefore, these two alternating conditions of excess and deficiency of water, are among the most pressing agricultural problems remaining to be solved.

Non-Agricultural Land. The problems associated with the use and development of land for residential, industrial, commercial, or recreational purposes, generally result from the same conditions which contribute to agricultural problems. Periods of high intensity or long duration rainfall on the flat, poorly drained residential areas cause serious damages and inconveniences for homeowners. This is especially true of residential communities which are not served by municipal storm and sanitary sewer systems.

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Many residential areas are poorly planned, with inadequate provisions for drainage, water systems, or street maintenance. Some of the streets are owned by adjacent homeowners who are responsible for maintenance. Prolonged rainfall periods cause saturation of the soil profile and a slow movement of water over land, damaging roads and streets, killing lawn grasses and shrubbery, in addition to other inconveniences caused by soggy soil conditions. Septic tanks do not function properly and health hazards are increased due to the danger of contamination of private water systems and increased breeding areas for mosquitoes and other insects.

Sales of large tracts of land in the Basin and the development of these areas into residential and commercial centers create problems, even where considerable planning has gone into the development of the property itself. Increased runoff rates resulting from street paving, home building, and street drainage systems, cause additional water problems for landowners downstream from this point where the land development is taking place. Random, uncoordinated efforts of this nature cause serious problems. As the development pace increases, water management problems are expected to increase to an even greater extent.

Soil Erosion and Sedimentation

Soil erosion and sedimentation are of minor importance in the Basin. The flat topography of most soils is largely responsible for minimizing these problems. Clearing of land for housing, roads and channel construction increases erosion and sediment hazards, but this is generally of a temporary nature. To keep damages to a minimum, cleared areas are usually vegetated as soon as construction is completed. Grade control structures are installed in construction channels and road ditches to reduce degradation of the channel bottoms.

Organic Soil Subsidence

The large area of organic peat and muck south and southeast of Lake Okeechobee was once an undeveloped area of sawgrass, with water standing at or above ground surface elevations most of the time. Approximately 375,000 acres of the organic soils are now being used for growing improved pasture, vegetables and sugarcane. After drainage systems are installed, the organic material begins subsiding due to compaction, oxidation and aerobic bacterial action, at a rate of about one foot in ten years. At present subsidence rates, the organic land will essentially disappear by 2020. Projections indicate that 545,600 acres will be too shallow for agricultural purposes (Table 3-2). The area immediately adjacent to the southeast shore of the lake has organic soil of sufficient depth to remain in production 20 to 30 years longer.

A problem related to the loss of the organic land is that of conflict between agricultural interests and those groups and individuals who support the preservation of the area in its natural condition. Agricultural interests have invested heavily in machinery, land, buildings, and drainage and irrigation facilities. This area supplies a major share of the nation's fresh vegetables during the winter months, as well as sugarcane and beef cattle. On the other hand, those in favor of keeping the area in its natural condition, point to the value of the organic lands for aesthetic purposes and water conservation for the Everglades National Park and the Lower East Coast.

Water Resource Problems

Large quantities of surface and subsurface water are located in the Basin, but rapidly increasing demands for this resource for agricultural, municipal, recreational, industrial and other uses have awakened planners and the general public to the probability that severe shortages may exist in the future. There are areas that have already experienced water shortages and these occurrences will increase in frequency and duration in future years. The problem is intensified by the uneven distribution of annual rainfall (Figure 4), low water-holding capacities of most soils, and a lack of storage sites for surface water. South of Lake Okeechobee the Floridan Aquifer is too saline for most uses. The Aquifer in this area has a chloride concentration of greater than 1000 parts per million, (Figure 35). This concentration is a result of the salt water remaining from the period of time when Florida was inundated by the ocean, rather than from salt water intrusion.

The concentrations of sulfates in the water of the Floridan Aquifer show a pattern similar to that of chlorides. Sulfate content in the Aquifer varied from less than 50 parts per million in the northern part of the Basin to over 250 parts per million south of Lake Okeechobee (Figure 36).

There are numerous lakes in the Basin, but Lake Okeechobee and Lake Istokpoga are the major sources of surface water used by agriculture. Lake Okeechobee is also utilized to meet the needs of the Everglades National Park, recharge the Biscayne Aquifer which is the source of water for the populous Lower East Coast, and to recharge the shallow aquifer that serves as the source of supply for the City of Fort Myers. At its present regulated stage of 15.5 to 17.5 feet (MSL), the Lake is not capable of meeting all these demands during dry years

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and the problem will become more acute as the demand for fresh water increases. Lake Istokpoga is located so that it can supply water by gravity flow to a large agricultural area southeast of the Lake. The capacity of Istokpoga is not sufficient to meet the projected water demands unless more surface storage is provided.

TABLE 3-2. Acres of organic soils, by depth - 1970, 2000, 2020[1/]

Depth (feet)	1970	2000	2020
		Acres	
0-1	64600	270400	545600
1-2	38400	74300	41900
2-3	64200	200900	19000
3-4	103200	41900	11500
4-5	74300	19000	6000
5-6	200900	11500	2500
6-7	41900	6000	
7-8	19000	2500	
8-9	11500		
9-10	6000		
10+	2500		
Total	626500	626500	626500

1/ Includes area south of Lake Okeechobee in Hendry and Palm Beach Counties. Areas measured on map, page 228 of "Subsidence of organic soils in the Upper Everglades region of Florida" by John C. Stephens and Lamar Johnson. Projections to future years based on these measurements, and using subsidence rate of one foot in ten years.

Fort Myers and western Lee County must rely on the shallow aquifer because of the high chlorine content of the deeper Floridan Aquifer. There is a serious threat of salt water intrusion if the shallow aquifer is overpumped. Fresh water is pumped from the upstream side of Franklin Dam in the Caloosahatchee River to recharge this shallow aquifer during dry periods. It is during these periods that the river water above the dam usually has its highest chloride content, due primarily to the lockage of boats through the structure. This area is experiencing very rapid urban growth and therefore the demand for fresh water will expand greatly in future years. Serious shortages are predicted for this area by 1980 or earlier if steps are not taken immediately to develop new sources of water.

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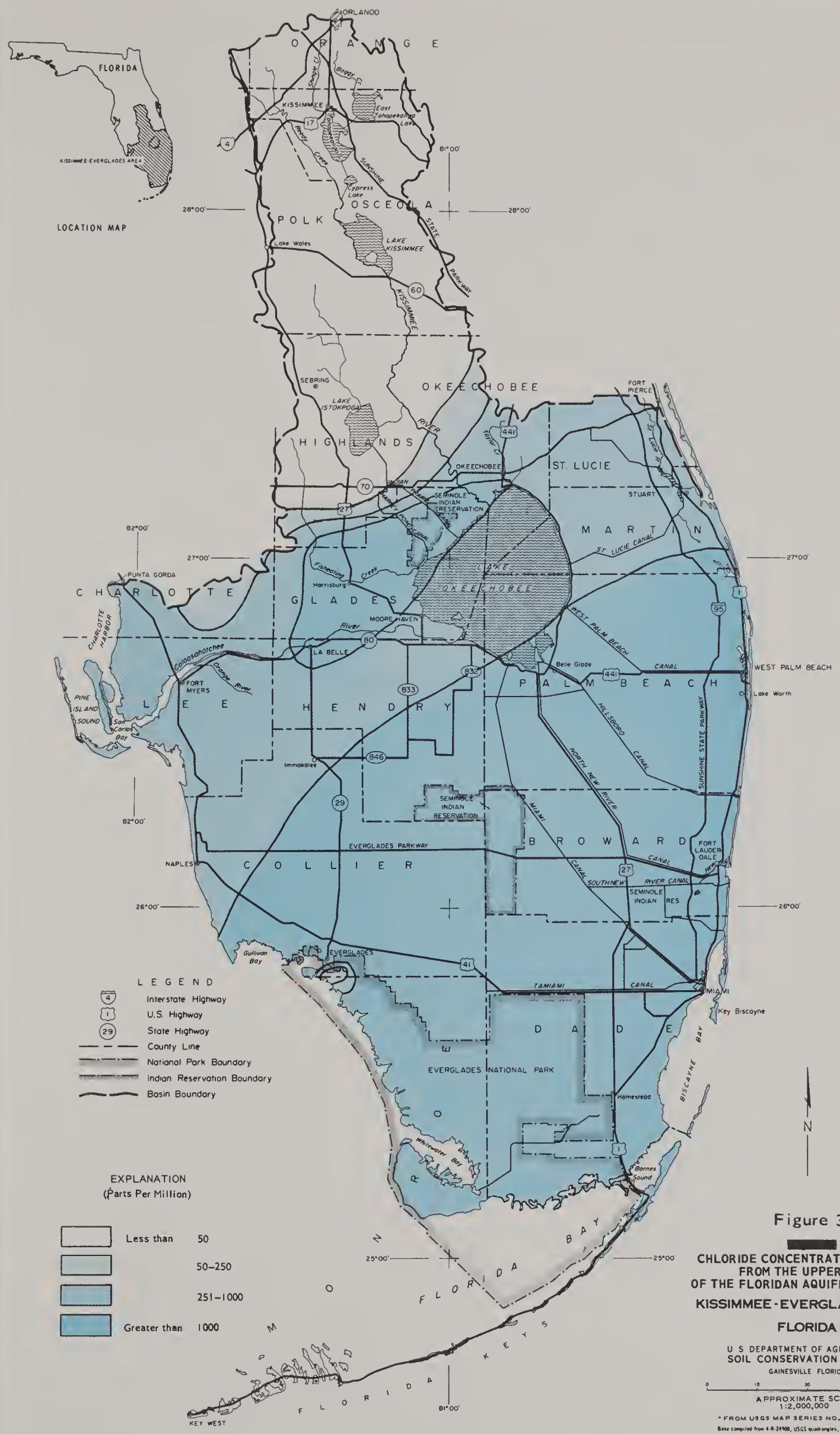

Figure 35

CHLORIDE CONCENTRATION IN WATER FROM THE UPPER PART OF THE FLORIDAN AQUIFER IN FLORIDA*

KISSIMMEE-EVERGLADES AREA

FLORIDA

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
GAINESVILLE FLORIDA

APPROXIMATE SCALE
1:2,000,000

* FROM USGS MAP SERIES NO. 12, MAY 1965

Base compiled from 4-R-24908, USGS quadrangles, and county highway maps
All planimetric detail taken from these sources

6-71 4-R-30545

USDA-SCS-FORT WORTH, TEX. 1971

May 1971

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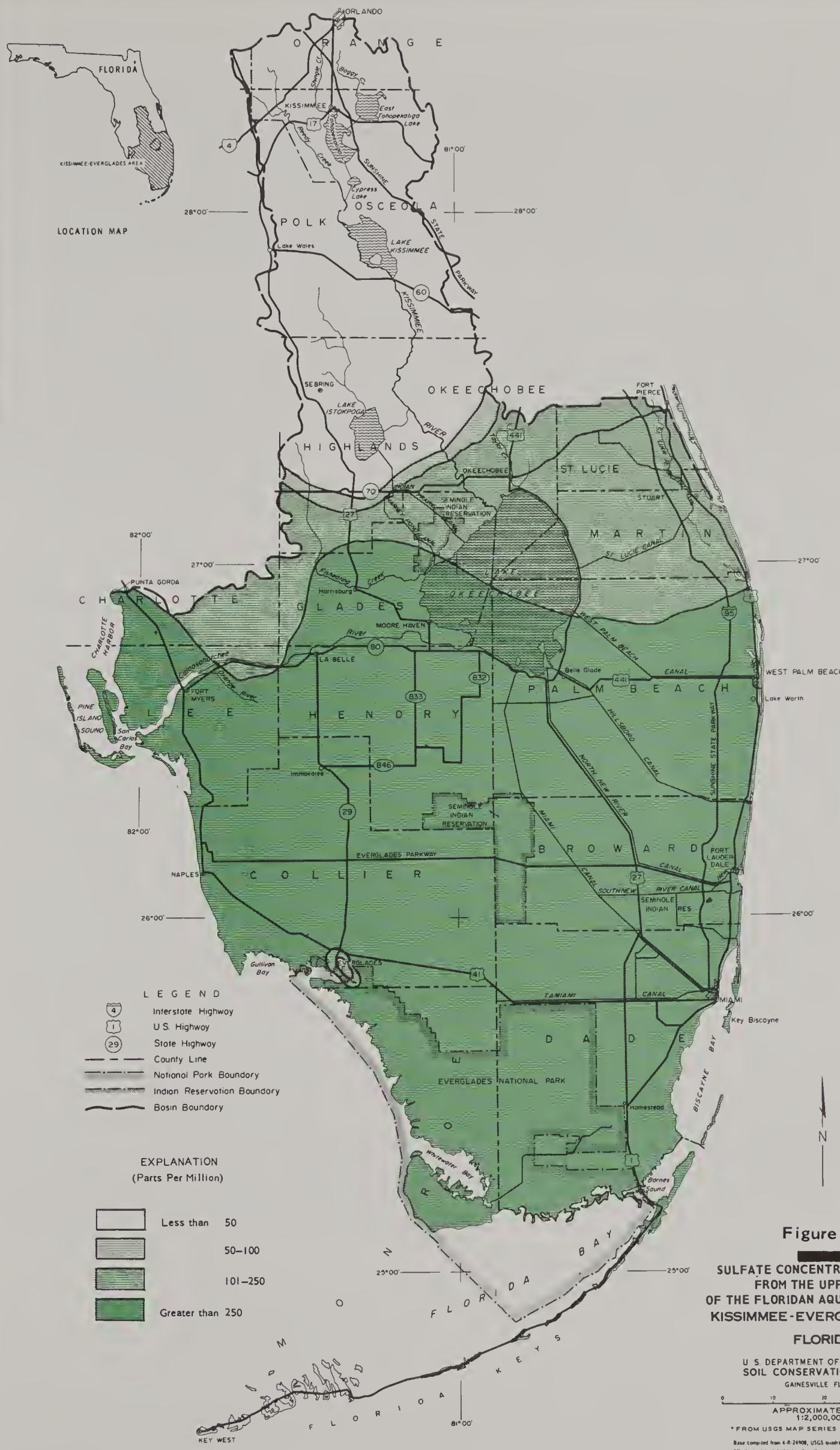

Figure 36

SULFATE CONCENTRATION IN WATER FROM THE UPPER PART OF THE FLORIDAN AQUIFER IN FLORIDA* KISSIMMEE-EVERGLADES AREA FLORIDA

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
GAINESVILLE FLORIDA

6-71 4-R-30546

Water shortages in the St. Lucie County area have forced citrus growers to drill deeper wells in order to obtain sufficient quantities. Water from these wells generally contains higher concentrations of chlorides and other contaminants than does water from the shallow wells. In some cases where sprinkler irrigation has been used on citrus, salt from the irrigation water has accumulated on the leaves sufficiently to cause defoliation.

No specific area in the Basin can be assumed to be free at any given time, from the possibility of shortages of water of usable quality. Unlimited withdrawals from the surface or groundwater supply in one portion of the Basin can seriously affect the amount available to other users some distance away, as well as to those in the immediate vicinity.

Forestry Problems

Range and Forest Fires

In 1968, 924 wildfires caused the mortality of over 8 million cubic feet of timber. More than 27,000 acres were burned representing nearly one and one-half percent of the protected forestland. There are approximately 161,000 acres of unprotected forestland, though fire protection began as early as 1940. Ninety-five percent of the fires were man caused. The major causes are incendiarism (35%), debris burning (30%), and smoking (21%). The largest number of fires and the greatest acreage losses were in the pine type. Fire occurrence was the highest during the month of March, followed in intensity by April, February and January. Fire suppression problems result from the inaccessibility of many areas, the presence of canals, rock soil and organic soil. The fire prevention job is intensified by the density of the population, the influx of people to the area and year-long recreation use.

Forest Insects and Diseases

Forest insects and diseases are a potential threat and surveillance for their damage is a continuing task. No infestations of insects or outbreak of disease were reported in 1968, but some mortality occurs annually from these causes.

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Other Forestry Problems

Over 40 percent (503,800 acres) of the commercial forestland is owned by farmers and other private owners other than pulp and paper companies. Many of these owners have insufficient interest to improve their forestland for increased production. Often these private non-industrial holdings are unmanaged, poorly developed, and cut over. Their contribution to wood production and other forest uses is less than half of their productive potential. Large investments are needed for this land to reach its potential level of production.

The nearest pulp mill is about 100 miles from the Basin. In many areas there is no market for pulpwood, especially in small quantities. Often timber from small land clearing operations is burned. High land prices, due to speculative possibilities, discourage the purchase of land for growing timber.

Pollution

The problem of pollution - air, water and soil - has, in recent years been receiving considerable attention throughout the nation. As increased demands are placed on the natural resources by all interests, these problems are certain to command an ever increasing amount of emphasis. This is especially true in the Basin due to the great influx of people with the resulting increases in development of urban and agricultural areas along with needed highways, utilities, and recreation facilities to satisfy the various needs and desires of the people. Opposed to the developers are those advocates of maintaining the natural environment in its native condition as far as possible. With the wide variety of interests involved in the area, solutions to the problems of pollution will be difficult. The discussions of the past have been based on a variety of data sources, ranging from scientific facts to imaginative ideas.

Pollution problems related to agricultural, industrial, and municipal waste disposal; use of chemicals to control insects and disease; herbicides used in crop production and control of noxious water weeds, need immediate attention. Mild temperatures contribute to the problems of disease and insect control. Aquatic weeds and plants grow year-round, clogging channels and streams.

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WILDFIRES AND FLOODS ARE DESTRUCTIVE

4-31002 11-71

S E C T I O N I V

PRESENT AND FUTURE NEEDS FOR WATER AND RELATED LAND RESOURCE DEVELOPMENT

In order to efficiently meet the present and future needs of the population for goods, services, and outdoor recreational opportunities, water and land resource protection, development, and management programs must be continued and accelerated.

The preparation of plans for development and management of the water and land resources to meet these human needs requires the adoption of certain basic assumptions regarding the national economy. These assumptions have been generally accepted by Federal agencies engaged in resource planning:

(1) There will be an expanding U.S. economy, without major wars or depressions, that will continue to become more efficient in satisfying human needs and wants. A similar situation will exist internationally and barriers to international trade will not increase beyond present levels.

(2) Industrial expansion will continue and "full employment" conditions will exist. Price relationships will not change and wide economic fluctuations will not occur.

(3) Federal - non-federal cooperation to encourage economic progress for all segments of society including progress in education, technology, and economic development will be encouraged.

(4) Resources and goods over time are free to move, without artificial restraints, both into and out of the Basin. Institutional barriers to economic progress will continue to be reduced.

(5) Demand and supplies of goods and services will reach an equilibrium level which results in satisfactory price levels to producers. New substitutes may be developed for agricultural commodities. However, this will be offset by new uses for old commodities.

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Components of the national economic framework used in this study are based on an Office of Business Economics study for the Water Resources Council. The major economic indicators used in that study are based on United States Series C population estimates which are lower than estimates previously used. Series C assumes a national annual growth rate of 1.3 percent per year, a substantial decline from the 1962-65 rate.

Land Requirements

There is strong competition between agricultural and non-agricultural interests for use of the land resources (Figure 37). As land prices and taxes increase, the land formerly used for agricultural purposes, and those undeveloped areas serving useful purposes as wildlife habitat and water storage areas, are shifted to higher valued uses. This is especially true in the Kissimmee-Everglades Area, where the mild climate and many miles of coastline attract ever increasing numbers of residential, tourist-oriented, and other commercial developments.

In projecting agricultural land use for the Basin, consideration was given to capabilities and productivity of the soils, increases in technology, and water management facilities. Allowance was also made for subsidence of the organic soils south of Lake Okeechobee which will necessitate the shift of large acreages of sugarcane and vegetables to mineral soils of lower productivity, requiring increased acreages to attain projected levels of production.

Cropland acreage is projected to increase from 782,900 acres in 1968 to 974,600 acres in 2020 (Table 4-1). Acreage of improved pasture is expected to have a net increase of about 500,000 acres during the projection period. The total acreage classified as agricultural is expected to continue to decline, from 7,236,100 acres in 1968 to 5,981,500 in 2020. This decline will result from growth and expansion of shopping centers, airports, highways, golf courses, residential and industrial complexes, and from development of recreation areas or preservation of natural areas for wildlife habitat or aesthetic purposes.

In 1968, approximately 1.28 million acres of cropland and improved pasture were in need of improved water management facilities. By 2020, this acreage is projected to be 1.85 million acres. Agricultural water management and flood prevention programs are needed if agriculture is to maintain production consistent with national economic development.

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Major Uses of Agricultural Land
Kissimmee-Everglades Area

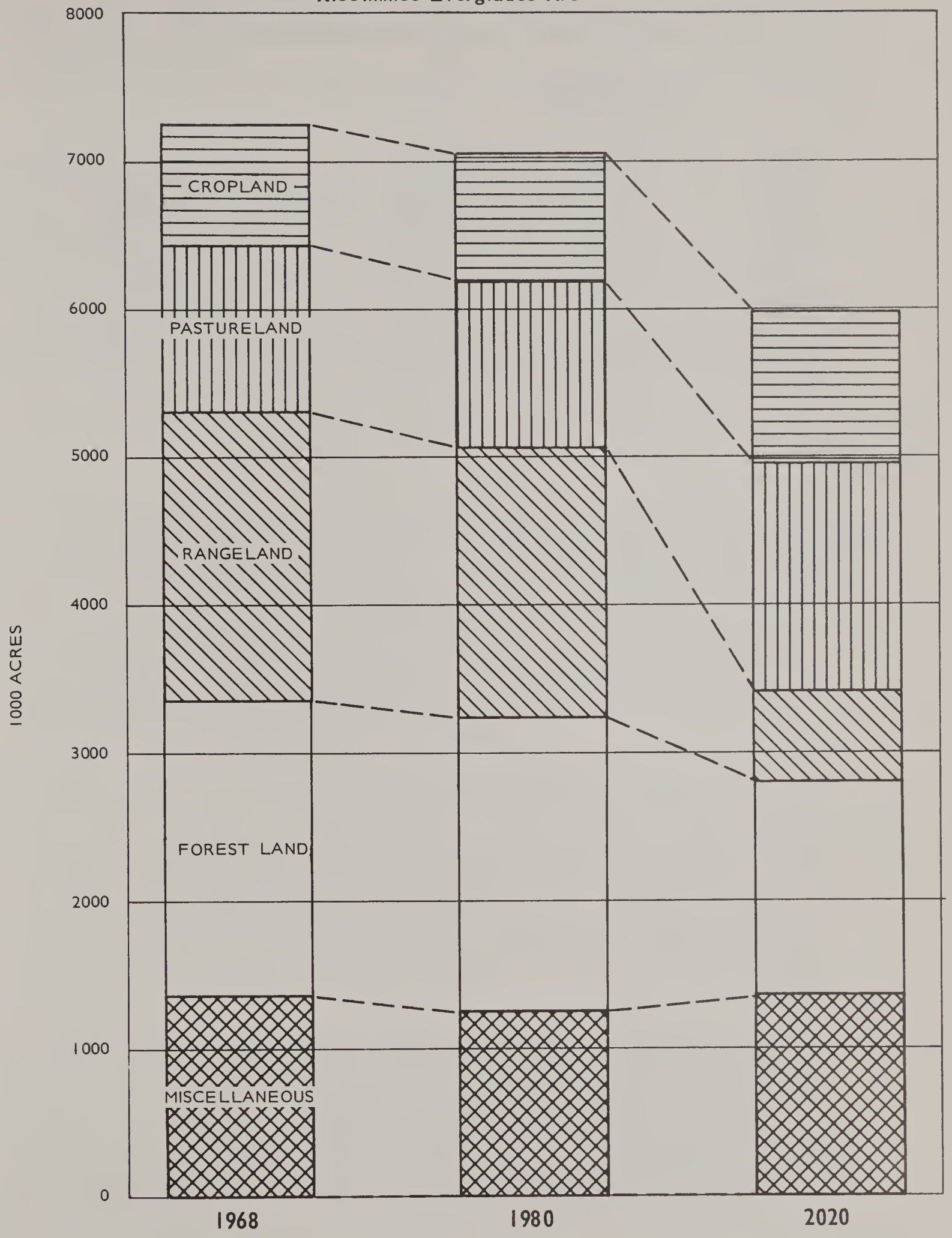

Figure 37

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TABLE 4-1. Land use, without accelerated resource developments, Kissimmee-Everglades Area, 1968, 1980 and 2020

Use	1968	1980	2020
		1000 Acres	
Cropland	782.9	839.6	974.6
Improved Pasture	1116.9	1124.2	1544.6
Range (Unimproved Pasture)	1948.5	1834.0	580.2
Forestland	1993.4	1986.7	1493.3
Miscellaneous	1394.4	1268.5	1388.8
Agricultural	7236.1	7053.0	5981.5
Non-Agricultural	2813.6	2996.7	4068.2
Total Land	10049.7	10049.7	10049.7

On the organic soils south of Lake Okeechobee, flood prevention and water management programs are needed to prolong, to the extent possible, the useful agricultural life of this area. Superior crop yields and climatic advantages on the organic soils make it possible to meet production requirements on a smaller acreage than would be required if all production were to shift to the mineral soils. So long as the organic soils are of sufficient depth for farming, other more marginal agricultural soils are available for non-agricultural purposes.

In 1968, the Basin demand for wood products was about 38 million cubic feet. Timber cut amounted to 13.4 million cubic feet, of which only 7.4 million was utilized. The remainder was removed in land clearing operations. Meeting the Basin's share of the national requirements for wood products will require substantial investments in land resource development to grow additional timber, and better utilization of the timber cut. Without such a program, the demand for wood products will continue to exceed supply.

By 1980, the projected Basin demand for wood products is 54 million cubic feet with the greatest volume being needed for pulpwood. It is estimated that supply will increase about one-half as rapidly as demand during this period. Future demands for wood products are even higher in proportion to the indicated supply under the present level of forest management (Table 4-2). Shortages of wood products with higher

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prices for lumber, plywood and paper products can be expected before 1980. Future recreation use of wilderness and forestland areas may be as much as four times the present level. Reductions in the amount of land available for timber production will cause shortages. Yields must be increased on the land remaining in forest, if production is to keep pace with increases in national requirements.

TABLE 4-2. Projected supply and demand for wood products, Kissimmee-Everglades Area

Year	Supply	Basin Demand	Percent of National Requirements
	Million cubic feet		Percent
1980	49.0	54.0	0.28
2000	70.0	120.0	0.41
2020	81.0	164.0	0.47

Water Requirements

An equitable allocation of available water resources among the many competing users in the Basin is of major concern to everyone. This relatively scarce resource is necessary to supply the constantly increasing demands of agricultural, urban and industrial interests, to provide recreational opportunities, fish and wildlife habitat, and to recharge the shallow aquifers for future use and protection against salt-water intrusion. Water use will continue to increase with or without accelerated agricultural resource development projects, because of increased water demands by the non-agricultural sectors (Table 4-3).

TABLE 4-3. Non-agricultural uses of water - Kissimmee-Everglades Area - 1968, 1980 and 2020

Use	1968	1980	2020
	Million gallons per day		
Municipal	349	565	1129
Golf Courses	39	50	80
Industrial (Self-Supplied)	12	16	29
Salinity Control	404	404	404
Rural Domestic	64	86	165
Basin Total	868	1121	1807

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Large quantities of water are stored in the underground aquifers, but the principal (Floridan) Aquifer, which underlies the entire Basin, is far below the ground surface from about Lake Okeechobee south, and is too highly mineralized for most purposes. The shallow aquifers are used in this area to some extent, but surface storage is the principal supply source (Figure 38). Conservation use and management of surface and subsurface water supplies through individual and public effort will be imperative in order to assure an adequate source of suitable quality water to meet the demands placed upon the resource. Water resource planning and implementation must be continued and accelerated if these demands are to be met. Approximately 80 percent of the total cropland in the Basin is irrigated at the present time. All of it is projected to be irrigated by 2020.

The majority of the water used for irrigation in 1968 came from surface sources (Table 4-4). These sources must be depended on to supply future irrigation needs if agriculture is to continue and expand, due to the generally poor quality and distribution of groundwater sources in South Florida. If projected levels of production for the Basin are met efficiently, irrigation water requirements will be much greater than they are at the present time, as indicated in Tables 4-5 and 4-6 and Figure 39.

TABLE 4-4. Sources of irrigation water by counties - Kissimmee-Everglades Area, 1968

County	Source		Total
	Surface	Subsurface	
	1000 Acre-Feet		
Broward	101.9	-	101.9
Charlotte 1/	0.7	14.9	15.6
Collier	-	32.2	32.2
Dade	-	48.0	48.0
Glades	112.1	5.8	117.9
Hendry	141.3	77.6	218.9
Highlands 1/	67.9	58.2	126.1
Lake 1/	0.8	4.6	5.4
Lee	4.8	27.6	32.4
Martin	87.0	26.6	113.6
Okeechobee 1/	-	41.4	41.4
Orange 1/	9.7	7.1	16.8
Osceola 1/	9.7	15.8	25.5
Palm Beach	882.2	-	882.2
Polk 1/	11.6	54.3	65.9
St. Lucie 1/	33.9	59.2	93.1
Total	1463.6	473.3	1936.9

1/ Partial County

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TABLE 4-5. Acres irrigated - Kissimmee-Everglades Area - 1968, 1980 and 2020
(1000 Acres)

County	1968			1980			2020		
	Crops	Pasture	Total	Crops	Pasture	Total	Crops	Pasture	Total
Broward	24.4	31.2	55.6	19.9	22.3	42.2	6.1	2.9	9.0
Charlotte[1/]	4.4	4.5	8.9	9.0	7.7	16.7	6.3	17.9	24.2
Collier	21.4	4.8	26.2	22.4	7.0	29.4	25.0	65.5	90.5
Dade	41.4	6.3	47.7	49.1	5.9	55.0	31.9	0.7	32.6
Glades	13.6	33.2	46.8	20.0	42.9	62.9	95.3	90.8	186.1
Hendry	53.6	45.4	99.0	59.3	70.4	129.7	207.3	130.1	337.4
Highlands[1/]	37.5	26.7	64.2	51.0	42.0	93.0	146.3	69.3	215.6
Lake[1/]	3.5	-	3.5	4.5	-	4.5	5.1	0.2	5.3
Lee	17.6	5.8	23.4	18.2	8.1	26.3		-	
Martin	47.0	19.7	66.7	53.4	27.1	80.5	103.3	52.8	156.1
Okeechobee[1/]	3.1	14.8	17.9	3.4	21.2	24.6	60.0	53.2	113.2
Orange[1/]	10.7	0.1	10.8	15.3	1.4	16.7	2.5	0.8	3.3
Osceola[1/]	13.2	2.1	15.3	18.3	6.5	24.8	34.1	37.9	72.0
Palm Beach	298.2	127.3	425.5	345.2	138.3	483.5	102.8	82.0	184.8
Polk[1/]	40.2	1.5	41.7	51.7	2.8	54.5	57.9	14.5	72.4
St. Lucie[1/]	52.3	9.4	61.7	59.4	18.5	77.9	90.7	38.8	129.5
Total	682.1	332.8	1014.9	800.1	422.1	1222.2	974.6	657.4	1632.0

1/ Partial County

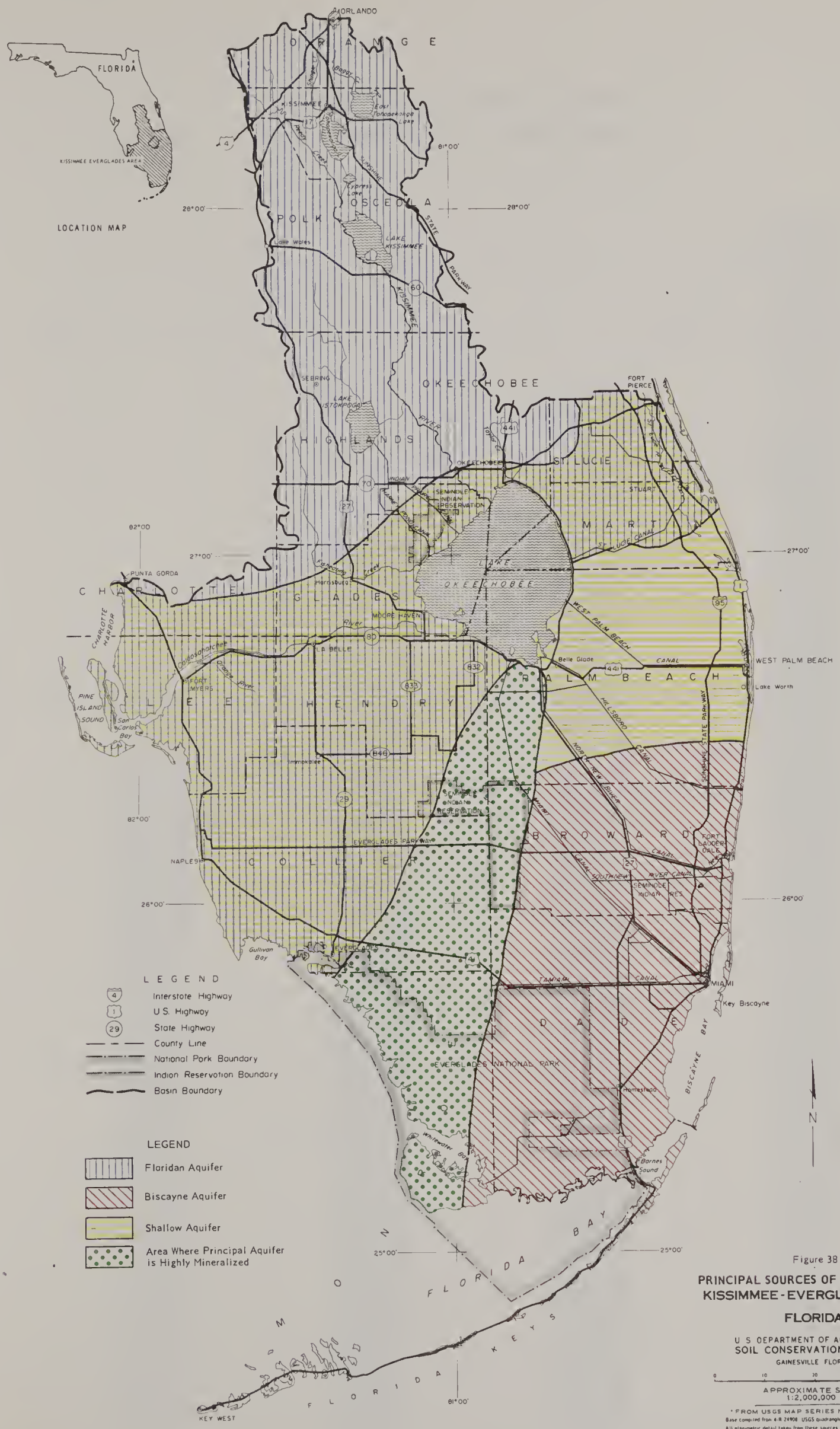

Figure 38

PRINCIPAL SOURCES OF GROUND WATER*
KISSIMMEE-EVERGLADES AREA
FLORIDA

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
GAINESVILLE FLORIDA

APPROXIMATE SCALE
1:2,000,000

* FROM USGS MAP SERIES NO. 16, MAY 1965
Base compiled from 4-R 24908 USGS quadrangles and county highway maps
All planimetric detail taken from these sources

6-71 4-R-30539

USDA-SCS-FORT WORTH, TEX 1971

May 1971

4-R-24908-A

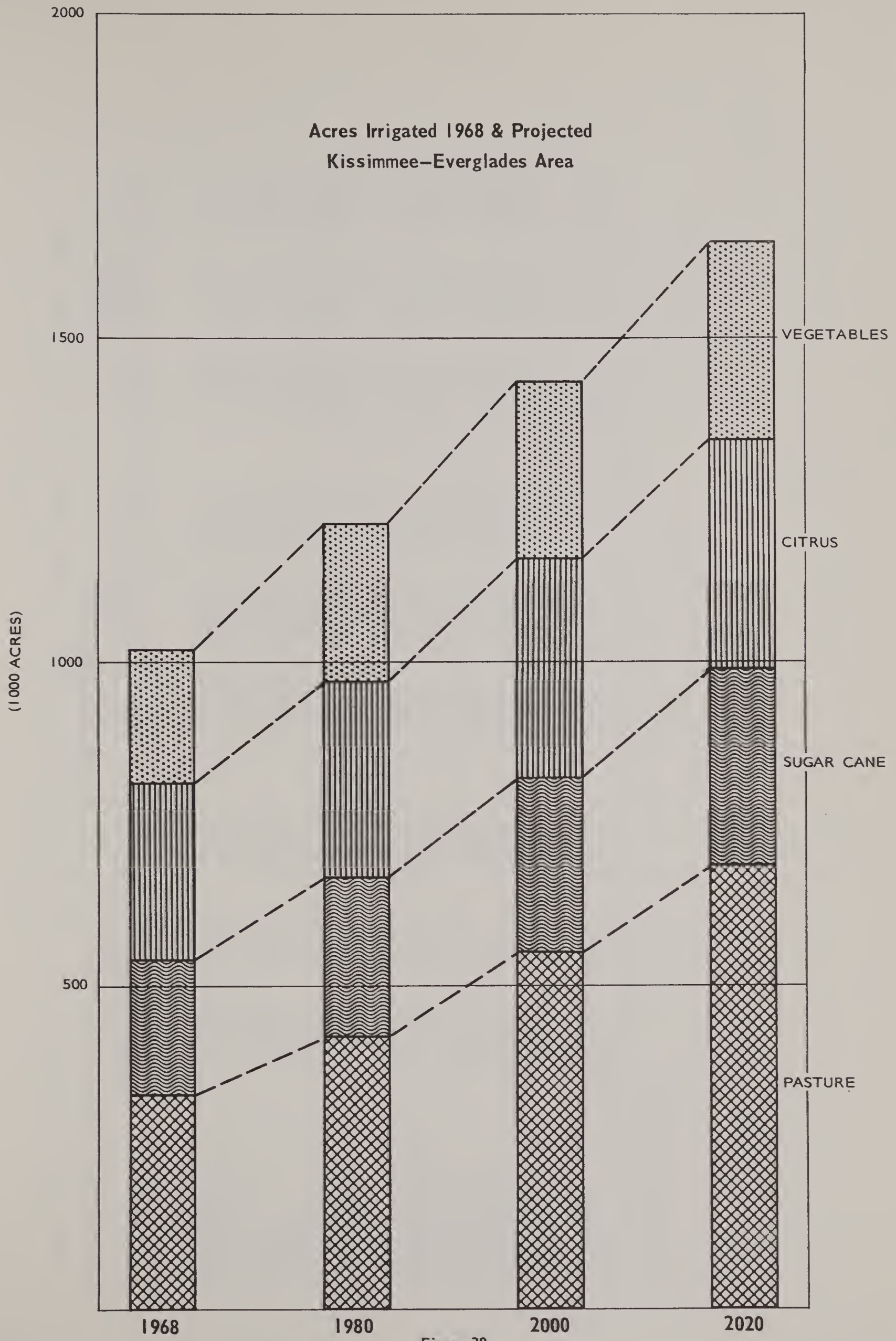

Figure 39

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4-30265 5-73

TABLE 4-6. Irrigation water requirements - Kissimmee-Everglades Area - 1968, 1980 and 2020
(1000 Acre-Feet)

County	1968			1980			2020		
	Crops	Pasture	Total	Crops	Pasture	Total	Crops	Pasture	Total
Broward	20.9	81.0	101.9	17.7	58.0	75.7	4.2	7.5	11.7
Charlotte 1/	4.0	11.6	15.6	7.9	20.0	27.9	10.2	46.5	56.7
Collier	19.6	12.6	32.2	20.2	18.3	38.5	22.3	170.3	192.6
Dade	31.6	16.4	48.0	37.1	15.3	52.4	29.7	1.8	31.5
Glades	31.6	86.3	117.9	41.4	111.6	153.0	181.3	236.1	417.4
Hendry	100.9	118.0	218.9	97.8	183.1	280.9	425.6	338.3	763.9
Highlands 1/	56.6	69.5	126.1	69.4	109.2	178.6	224.8	180.2	405.0
Lake 1/	5.4	-	5.4	6.9	-	6.9	7.9	0.5	8.4
Lee	17.3	15.1	32.4	17.8	21.1	38.9	-	-	-
Martin	62.5	51.1	113.6	70.7	70.5	141.2	139.0	137.3	276.3
Okeechobee 1/	2.9	38.5	41.4	3.7	55.1	58.8	107.4	138.3	245.7
Orange 1/	16.5	0.3	16.8	23.6	3.7	27.3	2.6	2.1	4.7
Osceola 1/	20.1	5.4	25.5	26.5	16.9	43.4	44.2	98.5	142.7
Palm Beach	551.3	330.9	882.2	662.2	359.8	1022.0	132.9	213.2	346.1
Polk 1/	62.0	3.9	65.9	79.7	8.1	87.8	84.8	37.7	122.5
St. Lucie 1/	68.6	24.5	93.1	77.5	48.1	125.6	134.3	100.9	235.2
Total	1071.8	865.1	1936.9	1260.1	1098.8	2358.9	1551.2	1709.2	3260.4

1/ Partial County

Irrigation requirements vary greatly from one portion of the Basin to another, and from one time frame to the next, as indicated on Figures 40, 41 and 42. In 1968, the agricultural area south of Lake Okeechobee had the highest concentration of water use, but will require relatively minor amounts by 2020 as the organic soils subside to the point where farming operations are forced to move to other locations. The data for these illustrations were developed for each planning unit and presented in terms of the depth in inches that the required irrigation water would be, if distributed evenly over the entire land area of the planning unit.

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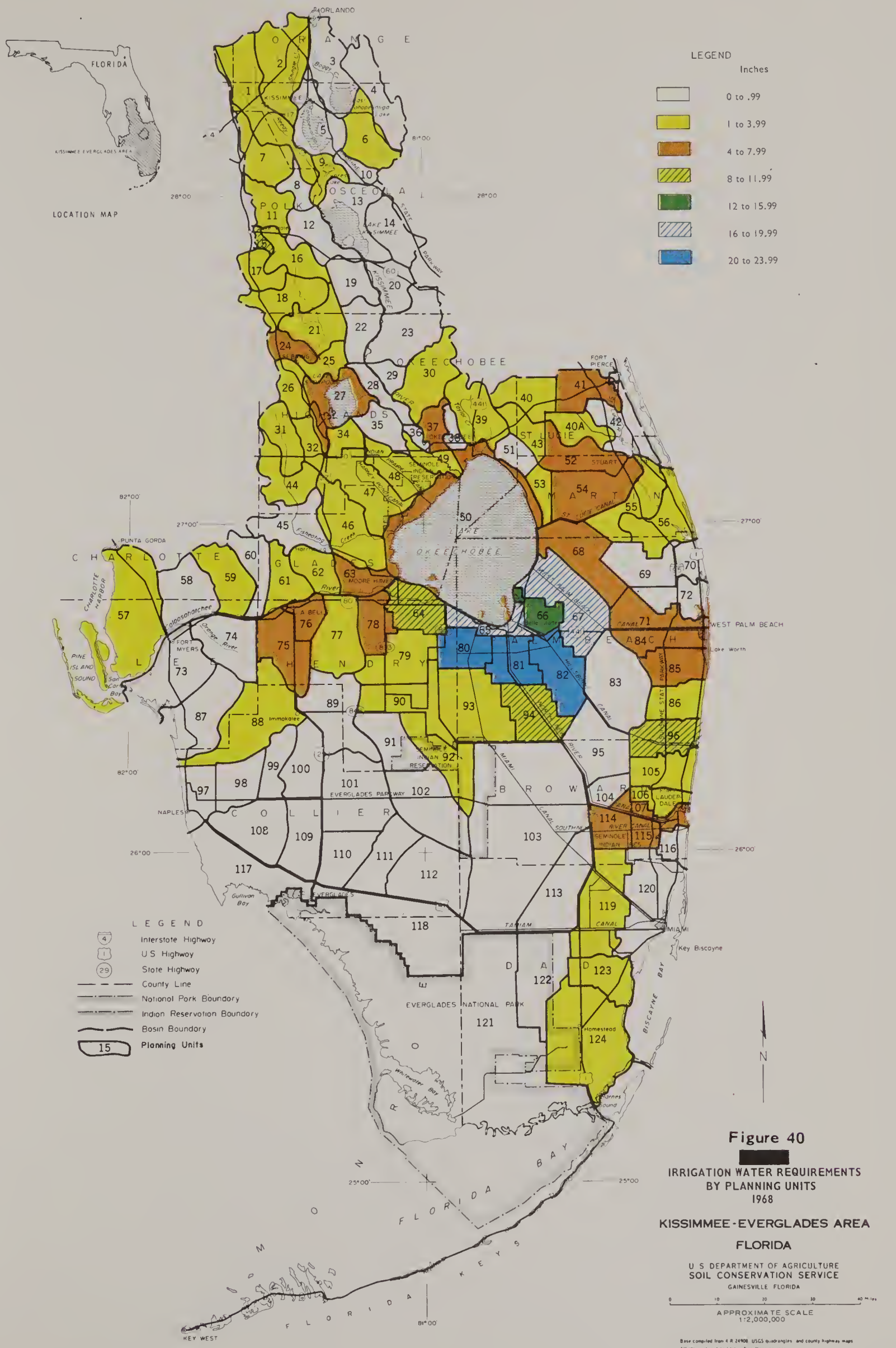
FLORIDA
KISSIMMEE EVERGLADES AREA
LOCATION MAP
LEGEND
Inches
0 to .99
1 to 3.99
4 to 7.99
8 to 11.99
12 to 15.99
16 to 19.99
20 to 23.99
ORLANDO
KISSIMMEE
OSCEOLA
POLK
OKEECHOBEE
HIGHLANDS
ST LUCIE
FORT PIERCE
MARTIN
PUNTA GORDA
CHARLOTTE
GLADES
HENDRY
COLLIER
BROWARD
PALM BEACH
WEST PALM BEACH
Lake Worth
FORT MYERS
NAPLES
Immokalee
Homestead
MIAMI
Key Biscayne
EVERGLADES NATIONAL PARK
Gullivan Bay
Whitewater Bay
Joe Bay
Barnes Sound
BISCAYNE BAY
FLORIDA BAY
KEY WEST
LAKE OKEECHOBEE
Lake Hatchineha
Kissimmee River
Caloosahatchee River
Charlotte Harbor
Pine Island Sound
San Carlos Bay
Fisheating Creek
Indian Prairie Canal
Hillsboro Canal
Miami Canal
Tamiami Canal
St Lucie Canal
Lake Worth Canal
Everglades Parkway
Seminole Indian Reservation
Big Cypress Seminole Indian Reservation
Florida State Turnpike
LEGEND
Interstate Highway
US Highway
State Highway
County Line
National Park Boundary
Indian Reservation Boundary
Basin Boundary
Planning Units
N
Figure 40
IRRIGATION WATER REQUIREMENTS
BY PLANNING UNITS
1968
KISSIMMEE-EVERGLADES AREA
FLORIDA
U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
GAINESVILLE FLORIDA
APPROXIMATE SCALE
1:2,000,000
Base compiled from 4 R 24908 USGS quadrangles and county highway maps
All planimetric detail taken from these sources
7-71 4-R-30567
USDA SCS-FORT WORTH TEX 1971
May 1971
7-71 4-R-30402

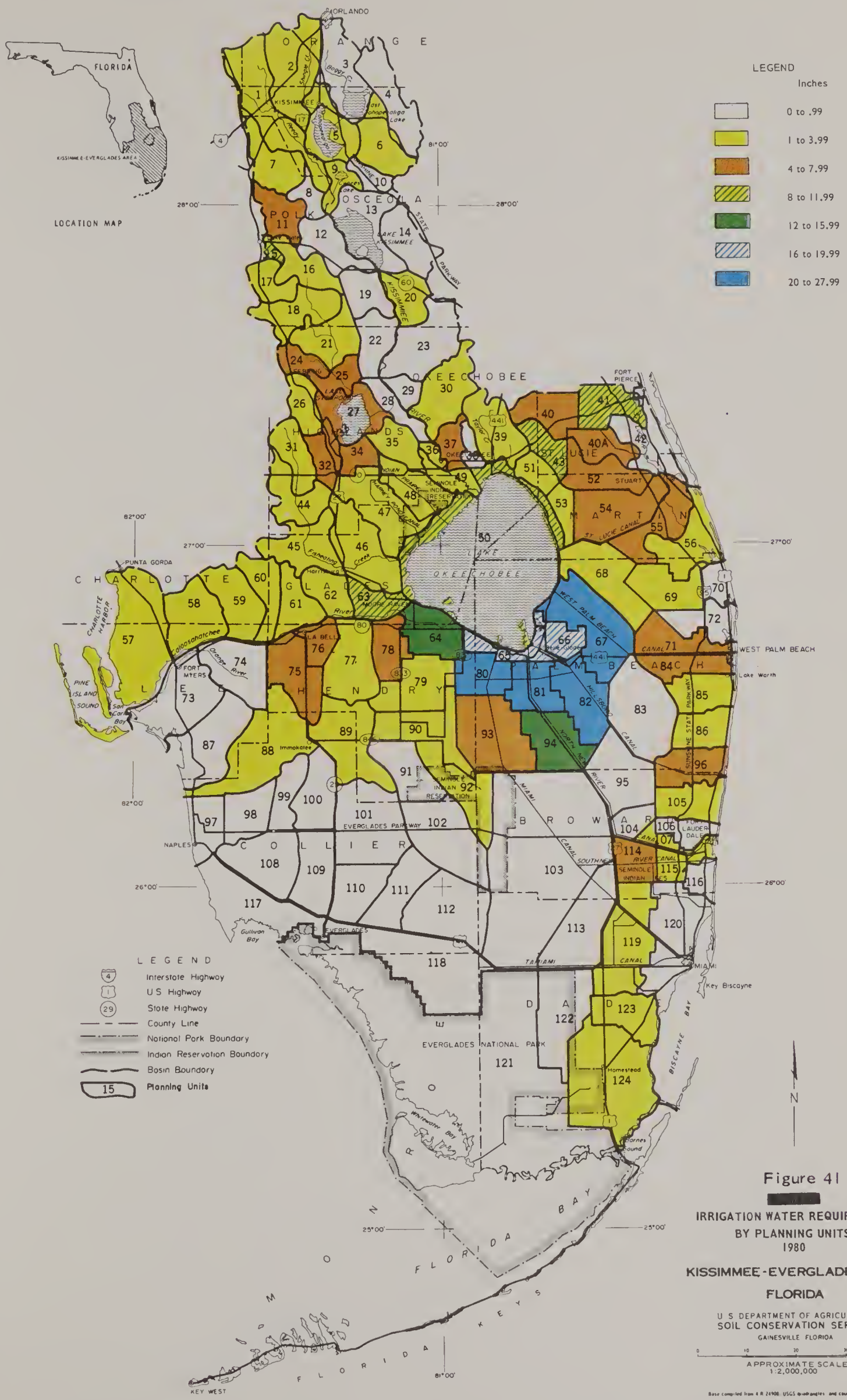

Figure 41

IRRIGATION WATER REQUIREMENTS
BY PLANNING UNITS
1980

KISSIMMEE-EVERGLADES AREA
FLORIDA

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
GAINESVILLE FLORIDA

0 10 20 30 40 Miles
APPROXIMATE SCALE
1:2,000,000

Base compiled from 4 R 24908, USGS quadrangles and county highway maps
All planimetric detail taken from these sources

7-71 4-R-30568

USDA-SCS-FORT WORTH, TEX 1971

May 1971

7-71 4-R-30402

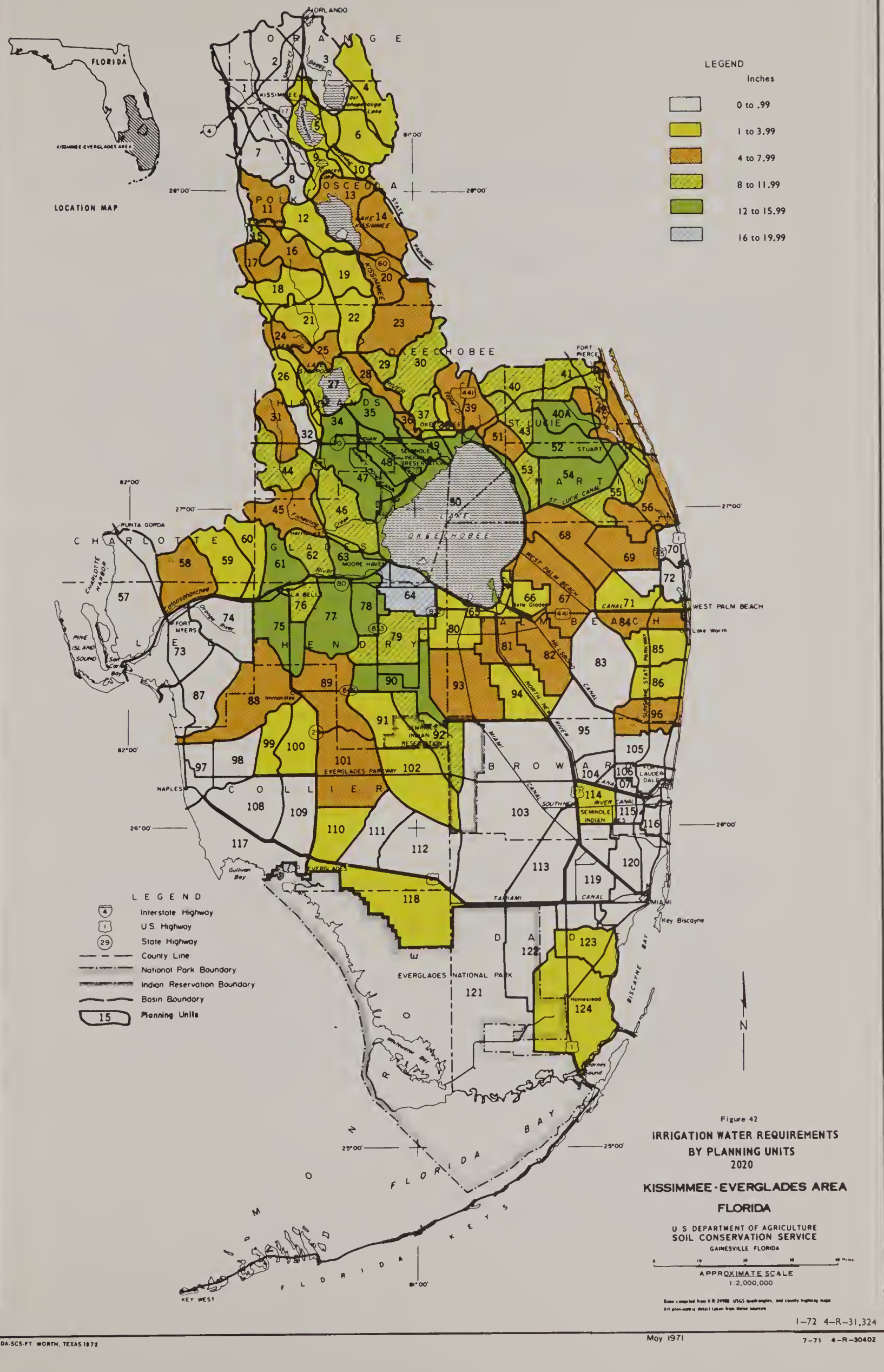

Figure 42

IRRIGATION WATER REQUIREMENTS BY PLANNING UNITS 2020

KISSIMMEE-EVERGLADES AREA

FLORIDA

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
GAINESVILLE FLORIDA

Base compiled from 6 R 2498 USGS quadrangles, and county highway maps
All planimetric detail taken from these sources

1-72 4-R-31,324

May 1971

7-71 4-R-30402

USDA-SCS-FT WORTH, TEXAS 1972

S E C T I O N V

EXISTING WATER AND RELATED LAND RESOURCE PROJECTS AND PROGRAMS

Federal Programs and Projects

Programs already in operation are making significant contributions to the protection and development of water and related land resources in the Basin. However, it is readily apparent that progress needs to be accelerated if major objectives are to be met. Excess water is the dominant problem on 94 percent of the 7.24 million acres of agricultural land in the Basin. There are many Federal, State and local agencies which have programs entirely or partially oriented toward land and water resource management and development.

U. S. Department of Army

Corps of Engineers activities are widespread within the Basin. Projects of this agency are in various stages of planning, design and construction. The Corps of Engineers has several areas of responsibility in the Basin, namely flood control, navigation, beach erosion and aquatic weed control. The major flood control project of the Corps of Engineers is the Central and Southern Florida Flood Control District project which has been authorized to be modified in part by the Water Resources Plan for Central and Southern Florida. This authorization was passed by the Flood Control Act of 1968.

The Central and Southern Florida Flood Control project covers 15,200 square miles beginning near Orlando, Florida in the headwaters of the Kissimmee River and extending south through Lake Okeechobee on to the southern tip of Florida. The Kissimmee-Everglades Area covers about 12,000 square miles of the Flood Control District. There is an area east of Orlando that drains into the St. Johns Basin that is within the Central and Southern Florida Flood Control District. The areas of Collier and Lee counties and the Everglades National Park in Dade and Monroe Counties are in the Basin but are not within the Flood Control District.

The U. S. Army Corps of Engineers reported[1/] the completed works on the Central and Southern Florida Flood Control District as follows: 11 pumping stations, 96 major control structures and 515 miles of canals, along with 575 miles of levees. Upon completion by the Corps of Engineers, these works are turned over to the Central and Southern Florida Flood Control District for operation and maintenance. The cost of these completed items was reported to be $191 million including federal appropriations and cash contributions by local interest. See Figure 45 for a map of the works of the Central and Southern Florida Flood Control District.

The plan of Water Resources for Central and Southern Florida was authorized by the Flood Control Act of 1968. This plan covers 16,000 square miles and modifies the existing Central and Southern Florida Flood Control Project plan, particularly with reference to provisions to improve the supply, distribution, and conservation of the water resource. The Water Resources Plan includes about 80 percent of the Central and Southern Florida Flood Control District plus Collier County and the Everglades National Park. Principal areas include the Kissimmee River Valley north of Lake Okeechobee, and Lake Okeechobee-Everglades agricultural area lying generally south and east of Lake Okeechobee, the East Coast-Everglades area further to the southeast and the Everglades National Park located at the southern tip of Florida.

The Water Resources Plan makes provisions to increase the storage of floodwater in Lake Okeechobee and the conservation areas by back pumping channels that heretofore have discharged floodwaters into the Atlantic Ocean along the southeast coast of Florida. The newly authorized plan calls for raising the stage regulation schedule from the authorized 15.5 to 17.5 feet (MSL) to 19.5 to 21.5 feet (MSL). This proposed raising of the Lake Okeechobee regulation schedule by 4 feet, and back pumping into Lake Okeechobee and the conservation areas will generate an increase of 737,000 acre-feet of water to be used to satisfy basic demands. All of this additional water will not be stored as some will be transferred to the Everglades National Park during flood stages. The average annual increased allocations above existing projects are 315,000 acre-feet to the Park, 340,000 acre-feet for Lake Okeechobee Service area, 82,000 acre feet for the Park not safely storable.

1/ Water Resources Development in Florida, by U.S. Army Corps of Engineers - Report dated 1 January 1969

The Survey Review Report for the Water Resources Plan for Central and Southern Florida concluded that the existing Central and Southern Florida Flood Control District Project, as amended, would supply all water demands through the year 1976 and that the newly authorized plan would satisfy demands to the year 2000. The recommended period of construction should begin before the problems start showing up in 1976 and stay abreast of problems with the project being completed by 1984.

The U. S. Army Corps of Engineers has completed 14 navigation projects involving channels and harbors and one waterway project with locks and dams. There are several other projects involving channels and harbors with locks and dams underway in the Basin. The more significant of the waterway projects is the Intracoastal Waterway from Jacksonville to Naples Bay. This waterway would carry traffic from the east coast to the west coast through the St. Lucie Canal, Lake Okeechobee, and the Caloosahatchee River. There are several locks to carry traffic from tide water on the Atlantic to tide water in the Gulf of Mexico. Many of these navigation projects are multi-purpose as they also serve as flood control channels.

The June 30, 1968 edition of Water Resources Development by the Corps of Engineers in Florida reported under the 14 completed channel and harbors projects a total construction cost of $17,245,000 and a maintenance cost of $5,385,000. This represents an average annual shipping tonnage from project ports in the Basin of approximately 7 million tons. The larger of these ports is Port Everglades which has an average annual tonnage of 5.8 million tons.

The U. S. Army Corps of Engineers has the responsibility for beach erosion control. This work is concerned with the restoration of eroded shores and their subsequent preservation. The beach erosion work acts to prevent future damages and the restored beaches provide improved recreational benefits.

The Corps of Engineers has 3 beach erosion control projects underway in the Basin with 4 additional projects authorized, but not started as of June 30, 1968. The estimated cost of the seven projects would be about $45 million.

In 1958, Public Law 85-500 authorized a comprehensive program for the control and progressive eradication of water hyacinths, alligatorweed, and other obnoxious aquatic plant growths in Florida and seven other southern states. This program was in the combined interest of navigation, flood control, agricultural water management, fish and wildlife conservation, public health,

and related purposes, including continued research for development of most effective and economic control measures. The Act provided that 70 percent of the costs of the project be borne by federal and 30 percent by local interest. The Rivers and Harbors Act of 1962 modified the cost sharing by providing that planning cost prior to initiation of operations and all research costs would be paid entirely by federal funds. This program was terminated in 1968.

A new program was authorized by Section 302 of the Rivers and Harbors Act of 1965 on the same cost sharing basis as the 1958 Act except that it eliminated local interest from cost sharing for planning prior to the start of construction, and all research costs. The Florida Game and Fresh Water Fish Commission was the agency designated as the local interest to work with the Corps of Engineers. In the Kissimmee-Everglades Area, the Florida Game and Fresh Water Fish Commission concentrated on operations in the Kissimmee River while the Corps of Engineers worked on Lake Okeechobee, Lake Istokpoga, Harney Pond and Indian Prairie Canals, Taylor and Fisheating Creeks and the Caloosahatchee River.

The cost of this aquatic weed control program for the ten-year period from 1958 to June 30, 1968 has been about $4.2 million, federal and non-federal funds, including research.

U. S. Department of Agriculture

Soil Conservation Service assists landowners, communities and institutions in planning, applying and maintaining soil and water conservation on their lands (Public Law 46). Under this Act, technical assistance is provided through Soil and Water Conservation District programs. Their programs are designed to promote the use of land within its capabilities and to treat it, within practical limits, according to the chosen use to prevent further deterioration of the soil and water resource. All counties in the Kissimmee-Everglades Basin have organized soil and water conservation districts except Dade, Collier and Monroe and are active in conservation program development.

The Watershed Protection and Flood Prevention Act (Public Law 566), as amended, provides for technical and financial assistance to state or local organizations in planning, designing, and installing watershed improvement works for flood prevention; agriculture water management (drainage and irrigation); and public recreation. The Soil Conservation Service administers the PL-566 program from the application stage to the completion of construction where the completed projects are turned over to the local sponsors for operation and maintenance. There are 15 active PL-566 applications in the Basin covering 478,000 acres (Figure 43). There are

4-30265 5-73

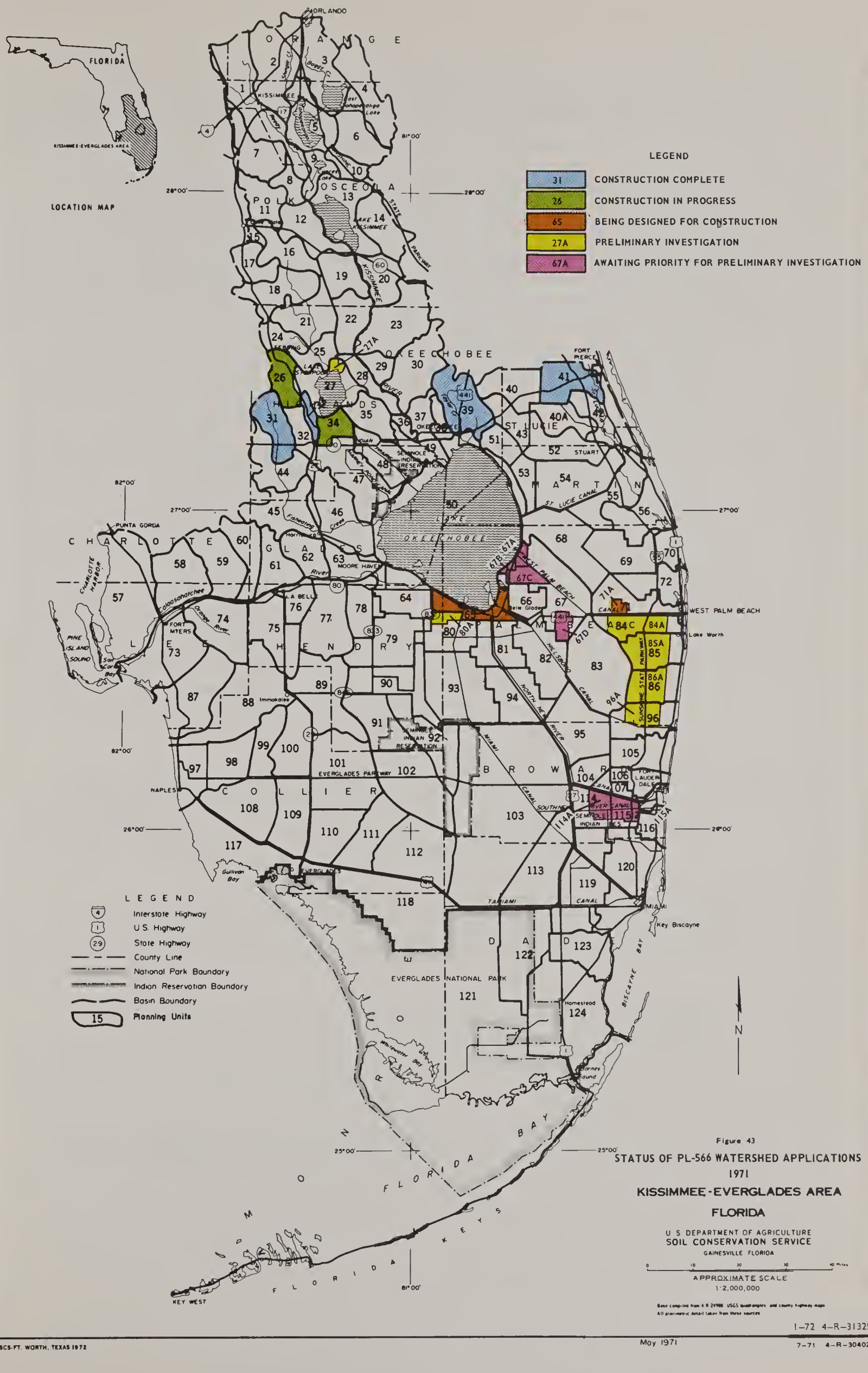

Figure 43

STATUS OF PL-566 WATERSHED APPLICATIONS
1971
KISSIMMEE-EVERGLADES AREA
FLORIDA

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
GAINESVILLE FLORIDA

APPROXIMATE SCALE
1:2,000,000

Base compiled from 4 R 26988 USGS quadrangles and county highway maps
All planimetric detail taken from these sources

1-72 4-R-31325

May 1971

7-71 4-R-30402

USDA-SCS-FT. WORTH, TEXAS 1972

eight planned projects covering 272,000 acres, of which six have been completed. The remaining seven PL-566 applications are in varying stages of planning and design.

There are five or more basic types of watershed projects in the Basin: (1) The large "flatwoods" areas of improved pasture, native range and citrus are typified by the Fisheating Creek and Taylor Creek Watersheds. (2) Lake flood control projects with specialty type flower crops, improved pasture and citrus, such as the East Chain of Lakes and the Upper Josephine-Jackson Creek Watershed. (3) Large citrus plantings in the Indian River citrus area with some pasture and vegetables, combined with urban expansion, such as the North St. Lucie River Drainage District Watershed. (4) The sand land winter vegetable and citrus growing in the southeast and southwest coastal areas, pressured by urban expansion, are represented by the Lake Worth-Acme and the Central Broward Drainage District Watersheds. (5) The subsiding organic soils underlain by rock that lie south and east of Lake Okeechobee. This area is noted for growing sugarcane, winter vegetables, grass sod, and improved pasture. The major problem is that all discharge water must be pumped. The South Florida Conservancy, Ritta, Gladeview, Pahokee and Pelican Lake Drainage Districts are representative of this type watershed. All of the PL-566 watershed projects south of Lake Okeechobee and a high percentage of the remainder in the Basin rely on the Central and Southern Florida Flood Control District canals for outlets.

Farmers Home Administration is a lending agency for providing supervised credit and management aid to people in rural areas. The Agency has three loan programs in the fields of rural housing, community services and farmer programs.

Rural housing loans can be made for individual home ownership, repair and rehabilitation housing, homesite development, self-help technical assistance, and conditional commitment to builders.

Community services loans can be made for water and waste disposal, watersheds, recreation enterprises, Indian land acquisition, irrigation and drainage, grazing association and resource conservation development.

Farmer program loans are for farm ownership, farm operating, and soil and water conservation.

Agricultural Stabilization and Conservation Service through its Rural Environmental Assistance Program[1/] allows land owners and operators to participate with the federal government on a voluntary basis in the installation of needed conservation practices on individual farms to help meet farm and watershed conservation goals. This program provides cost sharing assistance to farmers in implementing soil, water, forestland, pollution abatement, and wildlife conservation practiceson farmland now in agricultural production; it does not apply to development of new or additional farmland. The cost of the conservation practice is generally sharedequally between the federal government and the farmers. For some necessary conservation materials and services, the cost-share may be advanced as a purchase order. The conservation practice must be performed satisfactorily by the farmers in accordance with applicable specification, and maintained in accordance with good farming practices.

The Soil Conservation Service, U. S. Forest Service, State Forestry agencies and Extension Service have responsibilities for helping to formulate the Rural Environmental Assistance Program and to carry out certain of its technical phases. The Soil Conservation Service has the responsibility for the technical phases of applying specific REAP practices on the land, except those assigned to the Forest Service.

The most common enduring conservation practices in the Kissimmee-Everglades Area are the reduction of water pollution, water management structures, ponds, permanent grass cover, and tree planting. These will be directed toward reducing silt in streams, rivers and lakes and other bodies of water, and reducing pollution from animal wastes, fertilizers and pesticides.

The Sugar Program is administered by the Agricultural Stabilization and Conservation Service. Basically, the Sugar Act is intended to do three things: (1) Make it possible as a matter of national security to produce a substantial part of our sugar requirements within the United States; (2) Assure the United States consumers of a plentiful and stable supply of sugar at reasonable prices; and (3) permit friendly foreign countries to participate equitably in supplying the United States sugar market for the double purpose of expanding international trade and assuring a stable and adequate supply of sugar.

Florida's entire sugarcane acreage is located in the Basin. In 1968, this amounted to over 206,000 acres and represents 43 percent of the mainland sugarcane production (for sugar and seed).

1/ The Rural Environmental Assistance Program was terminated as of December 22, 1972. The future of this program or any program that might replace it is uncertain.

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The U.S. Forest Service cooperates with State and Federal agencies in its PL-566 and River Basin Programs and furnishes technical assistance for the protection, use and management of forestland. Assistance to forestland owners for the protection and development of forest resources is provided by the Forest Service through cooperative programs with the Extension Service and the Florida Division of Forestry. These programs are: (a) Cooperative Forest Management, (b) Forest Pest Control and (c) Cooperative Fire Control.

Forest management practices for which landowner assistance is available include site preparation, planting, harvesting, timber stand improvement and prescribed burning. In addition, forestland owners and industries are advised on utilization, milling and marketing of wood products. The production and distribution of planting stock enabled landowners to plant 4.4 million seedlings, mostly slash pine, during the 1968-69 planting season. The technical staff of the Florida Division of Forestry provides forest management assistance on all forestland. Good forest management, in most counties is more dependent upon the interest of landowners than the amount of assistance available.

The Forest Pest Control Program provides financial and technical assistance to landowners for the protection of forestland from insects and diseases. Aerial surveys are made periodically to locate areas attacked by forest pests.

The Florida Division of Forestry is responsible for forest fire protection under the cooperative Fire Control Program. The protection of forestland is a matter of formal contract between the Division of Forestry and the individual counties. In 1968, thirteen counties had fire protection covering nearly 3.3 million acres. Since that time two additional counties have been placed under protection leaving Martin County, part of Monroe County and part of Hendry County unprotected.

There are forty lookout towers in and adjacent to the study area, three of which are owned and operated by the U. S. Department of Interior - Park Service. Ten of the tower sites serve also as work centers having warehouse and maintenance facilities for fire suppression equipment and housing for personnel. Two lookout tower sites have been approved in Osceola County and one in Palm Beach County. The existing towers average about 18 miles apart and are adequate for fire detection under ordinary weather conditions. The location of the lookout towers, work centers and unprotected areas are shown on Figure 44. Specialized fire fighting equipment is used for muck fires, fires on rocky areas and to operate on

boggy land. The present level of fire protection is adequate within the protected area for all forest resource uses. Based on the county contract acreage, the cost of fire protection for 1968-69 was $0.319 per acre.

The Forest Research Program includes testing several species of tropical hardwoods to determine: (1) fast growing pulpwood trees, (2) valuable cabinet woods, and (3) trees for problem areas. Several species were screened and seedlings of the desirable trees produced for commercial plantings. All were found to be limited to the temperature range existing as far north as Bradenton. This research was done by the cooperative work of the Florida Forests Foundation, the Florida Division of Forestry, and the U. S. Forest Service. The project was directed from the Forest Service Laboratory in Lehigh Acres, and the seedlings were grown in the Herrin Nursery, north of Ft. Myers.

The economical potential of Eucalyptus gradis, E. robusta and E. camaldulensis has been demonstrated. These species have been planted commercially and a pulpwood sale made from the plantation.

Indian Rosewood (Dalbergia sisso), proved to be a desirable cabinet wood that grows well on spoil banks of marl soil. A commercial planting of this species has been made.

Salt resistant species having soil-holding ability were studied for use on problem areas such as sand dunes and coastal areas. Wild Tamarind (Lysiloma bahamensis), Australian Pine (Casuarina equisetifolia) and Acacia (A. longifolis, A. cyanopholla, A. auriculaeformis) proved to be desirable for these areas.

Future research work with tropical hardwoods will be directed toward producing Eucalyptus wood in south Florida. Producing large quantities of pulpwood will depend on: (1) selecting strains that have superior growth characteristics, (2) developing nursery and outplanting techniques to reduce the cost of establishing plantations, and (3) devising fertilizer prescriptions to increase growth rates.

Agricultural Research Service has a field station doing research on soil and water problems in the Basin. The station is located at Ft. Lauderdale working in cooperation with the Central and Southern Florida Flood Control District, the Agricultural Research Service, Plant Science Research Division and the Florida Agricultural Experiment Station.

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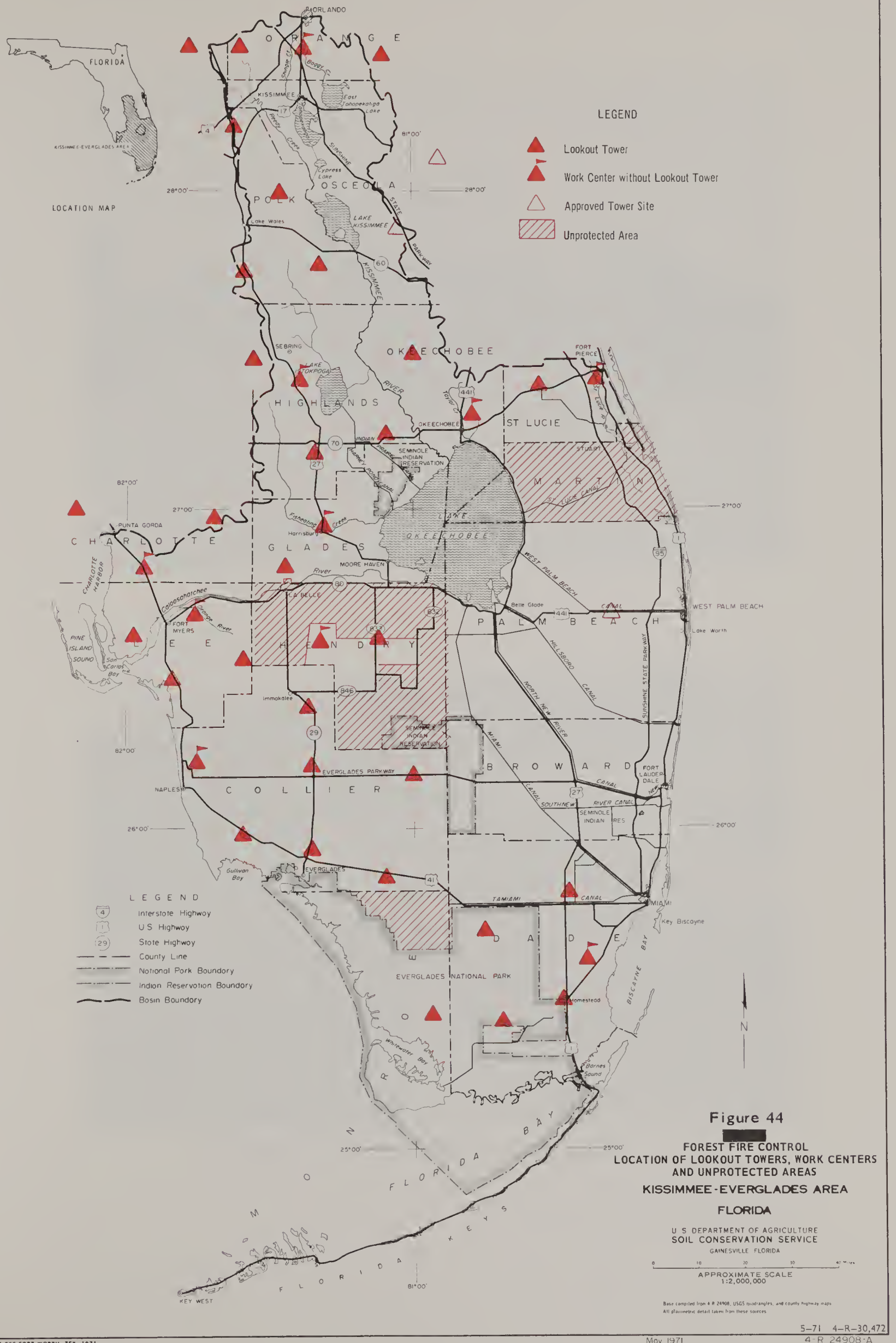

Figure 44

[redacted]

FOREST FIRE CONTROL
LOCATION OF LOOKOUT TOWERS, WORK CENTERS AND UNPROTECTED AREAS
KISSIMMEE-EVERGLADES AREA
FLORIDA

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
GAINESVILLE FLORIDA

0 10 20 30 40 Miles
APPROXIMATE SCALE
1:2,000,000

Base compiled from 4-R 24908, USGS quadrangles, and county highway maps
All planimetric detail taken from these sources

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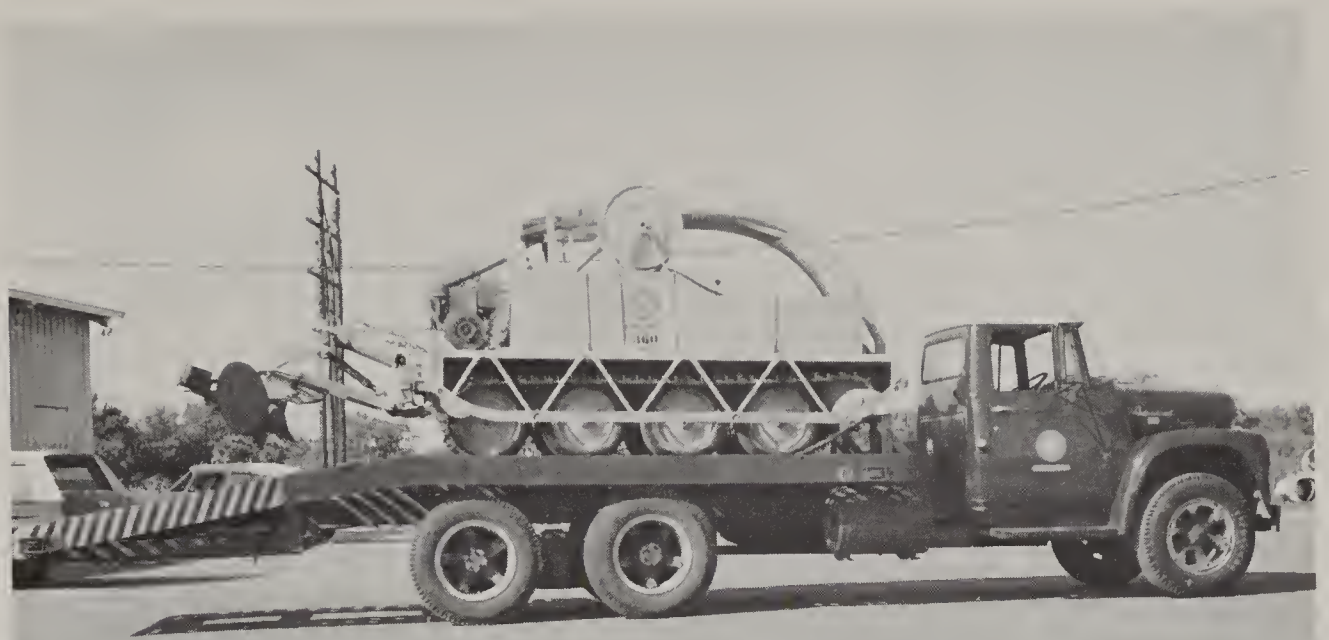

EQUIPMENT FOR SUPPRESSING MUCK FIRES

Photos courtesy Florida Division of Forestry

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FIRE PROTECTION EQUIPMENT FOR USE IN ROCKY AREAS

Photos courtesy Florida Division of Forestry

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A POTENTIAL COMMERCIAL FOREST

TREES MAKE EFFECTIVE WINDBREAKS

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The station is doing research work on small agricultural watersheds that is unique in the Southeast. The five research projects include: (1) Investigation of sandy trouble spots in dug water control channels, (2) Developing methods to predict storm runoff rates, (3) Developing methods to predict runoff yields, (4) Determining the water balance from climatic data, (5) the effects of groundwater (and piezometric) levels on evaporation, transpiration, and streamflow.

Economic Research Service provides a wide variety of research reports on rural affairs including: research and analysis of agricultural production and adjustment; marketing of food and fiber as it relates to the producer, the distributor and the consumer; planning assistance in comprehensive land and water resource studies; economic and statistical research related to the adjustment problems of rural people and the development of rural areas.

U. S. Department of Interior

National Park Service operates the Everglades National Park, an area embracing about 2,100 square miles of land and water along the southern tip of Florida. It is the largest sub-tropical wilderness in North America and the third largest national park. The Park's vegetation is made up of Jamaica sawgrass; clusters of trees (hammocks) that form islands of dense vegetation, bald cypress and pine forest. Along the coast, this expanse gives way to vast, shadowy mangrove swamps interlaced by winding waterways in the Ten-Thousand Islands.

The ecological problems involved in the proposal to build a Jet Port and the proposals to drill for oil have brought about national concern for the Park's future. The proposed Jet Port was suspended with only a training runway left in operation. The Water Resources Plan for Central and Southern Florida allocated larger quantities of water to the park with a proposal to carry all flood flows, not safely storable, to the park. This was proposed to better stabilize the ecological balance of the park and to give a better salt-fresh water balance to the estuaries that are important breeding grounds for marine life. This proposal would help to control the devastating wild fires that have burned out of control during the extreme dry years.

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Geological Survey program involves the systematic collection, analysis and interpretation of data; continued research to improve the understanding of various phases of the hydrologic cycle; and publication of the findings. Hydrologic studies made by financial cooperation with other agencies provide technical information needed for locating, planning, designing and constructing water resource projects, highway, bridges, dams and water control structures for regulation and water management.

The U. S. Geological Survey has cooperative agreements with six county governments within the basin and about 12 studies with the Central and Southern Florida Flood Control District and the U.S. Army Corps of Engineers. There are 203 streamflow stations in the area and data on 244 additional locations are being collected. The U. S. Geological Survey conducts numerous hydrologic studies in southeastern Florida to evaluate the effects on the water resources created by development of the Central and Southern Florida Flood Control Project, urbanization, industry, and agriculture. A detailed report is being prepared by the Agency concerning the hydrologic effects of water control and management of southeastern Florida.

Bureau of Sports Fisheries and Wildlife has the responsibility for insuring the conservation of the country's wild birds, mammals and sport fish for both their recreational and economic values. The Bureau manages eight national wildlife refuges in the Basin comprising some 158,000 acres. Most of these refuges are limited purpose outdoor recreation areas, providing primarily for nature study and natural scenery appreciation. The refuges also enhance or provide opportunities for hunting, fishing, camping, picnicking and similar outdoor recreational activities.

Bureau of Indian Affairs program involves furnishing technical assistance to the tribal councils in matters related to soil and water resource development. Engineers and agronomists are available to assist in these programs. The State holds some 105,600 acres of land designated as Indian land in Broward and Palm Beach counties, of which 80,000 acres are in the Conservation Pools. The Bureau of Indian Affairs has given some technical and management assistance in the use of these lands.

Environmental Protection Agency

This Agency was established in 1970, bringing together 15 programs which had been scattered through several agencies. The new organization was set up as an independent regulatory agency, reporting directly to the President of the United States. It is charged

with mounting a coordinated frontline attack on the environmental problems of air and water pollution, solid waste management, pesticides, radiation and noise. The Envrionmental Protection Agency is a regulatory agency having quasi-judicial functions in areas defined by Congress and the President as a law enforcement agency, and to a degree functions as police, prosecutors and judge. It sets standards, evaluates public adherence to these standards and enforces the laws requiring compliance with those standards.

To insure that all of its efforts are responsive to the needs, it has established ten regional offices. Each office is headed by a Regional Administrator who works closely with state and local officials, industry and other federal agencies to insure maximum effectiveness of environmental programs and anti-pollution activities.

State Programs and Projects

Department of Natural Resources

Division of Interior Resources has the following programs of investigation and research: (a) Conservation and development of underground water supplies including their preservation and improvement, location and descriptions, and geological input; (b) General and environmental research on tide data, provisions of necessary maps, and provisions of a research library; (c) Oceanographic research as applied to the interpretation of geological history and systematic and ecological studies; (d) Determination of high water lines in Florida lakes; (e) Monitoring of groundwater levels; (f) Determination of priorities for flood planning information reports.

The Division of Interior Resources monitors the construction status, and the development account of the Corps of Engineers' Central and Southern Florida Flood Control Project, and guides and coordinates the activities of the Flood Control District.

The Division of Interior Resources administers the Salt Water Barrier Line Program of the State of Florida. The establishment of salt water barrier lines is a county-operated program. After a barrier line is set, no stream or channel improvement may occur on the land side of the line without a permit. This prevents the contamination of fresh ground and surface water by salt water along the coastal areas. Dade and Collier counties have established salt water barrier lines. Broward County has made investigations in this regard. A potential source of conflict in the administration of the Act is in attempting to meet navigational needs and simultaneously protect the fresh water resources.

The Artesian Well Control Program under the Salt Water Barrier Line Program is very important in the protection and conservation of the valuable ground water resources of the State. In 1970, operations in fourteen counties were conducted within the Basin. It involves locating flowing wells with special attention to wild wells, establishing condition of well casings from the viewpoint of control or plugging, and testing water quality. This program is particularly active in St. Lucie, Martin, Glades, Hendry, Lee and Charlotte Counties.

To protect the State's artesian system, State water law contains requirements which restrict the waste of artesian water and specifies that it must be used for beneficial purposes only. State law requires the control of flowing artesian wells which are too highly mineralized to be used as a supply well. If the landowner fails to control the flow of artesian water, he may be charged with a misdemeanor.

The 1959 inventory of wells in the Kissimmee-Everglades Basin included 1418 wells in fourteen counties with an estimated total yield of 28,153 gallons per minute. Of this total, 531 were wild wells flowing continuously with 378 having a chloride content of 250 milligrams per litre. Fifty-six of the wells had open casings conducive to contamination.

The Bureau of Geology has the following responsibility in related land resource development: (a) Regulation and control, development and production of oil and gas resources in Hendry, Collier, Glades and Lee counties, (b) Acquisition and dissemination of resource data on the solid minerals and contained fluid resources of the Basin.

The Bureau of Waterways promotes the development of an integrated system of navigable waterways, ports, harbors for the shipping, travel and recreation needs of waterborne transportation.

The Bureau of Water Resources is preparing the State Water Resources Plan. The Bureau is further engaged in: regional and national participation in water resources planning; water resources inventory and data acquisition, evaluation processing, and publication of reports. The Water Resources Act (P.L. 89-80) gives the U. S. Water Resources Council the authority to provide a program of matching federal grants to states for comprehensive water and related land resource planning. The Kissimmee-Everglades Basin Report is an example of these reports. The Bureau uses the agricultural land and water resources information from this report to publish a companion report covering the land and water resources needs from all sectors.

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Division of Recreation and Parks has the responsibility of administering the State's public recreation program. This program includes development, operation, and maintenance of Florida State parks, the conservation of natural resources, and the preservation of historic sites. The Division operates through four bureaus: Planning and Grants, Land Acquisition and Development, Park Operations and Recreational Services.

Division of Game and Fresh Water Fish under the Game and Fresh Water Fish Commission operates through four bureaus: Wildlife Protection; Fresh Water Fish Management; Game Management; Wildlife Education.

The Division has nine fish management areas and seven game management areas in the Kissimmee-Everglades Basin. The fish and wildlife resources of Water Conservation Area No. 1 are managed by the U. S. Fish and Wildlife Service. The Florida Game and Fresh Water Fish Division manages these resources in Water Conservation Areas No. 2 and 3.

The Florida Game and Fresh Water Fish Commission was the agency designated to represent local interest in working with the Corps of Engineers under the program authorized by Section 302 of the Rivers and Harbors Act of 1965. This Act is for aquatic weed control and authorizes a comprehensive program for the control of water hyacinths, alligatorweed and other obnoxious plants. In the cooperative effort, the Game and Fresh Water Fish Division has concentrated its work on the Kissimmee River while the Corps of Engineers has worked in the remainder of the Basin.

Coastal Coordinating Council within the Department of Natural Resources was established July 1, 1970. The Council is responsible for developing a comprehensive State plan for the protection, development and zoning of the coastal zone of Florida. In order to optimize the use of recreational potentials, coastal zone plans and programs will include providing for open space within the urbanized areas, preserving unspoiled areas, encouraging the expansion of cultural, historical and educational facilities and reducing the degradation of beaches and coastal waters.

Florida Environmental Inventory Council under the Department of Natural Resources was created to advise the Department in the development of an inventory of Florida's environment and natural resources, for purposes of identification and classification, including a statement of specific present use or uses of each of the natural resources and the environmental factors affected by these uses.

Department of Administration

State Planning and Development Clearinghouse aids in the coordination of federal or federally assisted projects and programs with State, regional and local planning for growth and development. Clearinghouse functions include: (a) Evaluating the significance of proposed federal or federally assisted projects to State, area-wide or local plans and programs; (b) Receiving and disseminating project notification to appropriate state agencies and providing liaison as may be necessary between such agencies or bodies and the applicant; (c) Assuring that appropriate State, metropolitan, regional or local agencies which are authorized to develop and enforce environmental standards are informed of and given opportunity to review and comment on the environmental significance of proposed projects for which federal assistance is sought.

Department of Pollution Control

The Governor heads the Pollution Control Board. The Board is composed of five citizens and an executive director appointed by the Governor, subject to confirmation of the Florida Senate. The activities of the Department are conducted by a Division of Planning and a Division of Operations. The State is divided into six regions with a State pollution control engineer assigned to each region. The engineer offers assistance and advice to those involved in local programs within the region. Municipal sewage, citrus, sugar, pre-mixed concrete, renderings, synthetic fibers are only a few industries among the many in the area with which the Department is involved in pollution control.

The Department of Pollution Control has completed a very important program of classifying water according to its best use. The Department has established classes as follows:

Class I - Public Water Supply

Class II - Shellfish Harvesting & Shellfish Propagation & Harvesting

Class III - Recreation- propagation & management of fish and wildlife

Class IV - Agricultural and Industrial Water Supply

Class V - Navigation, Utility and Industrial Use

All lakes, streams and canals were classified as Class III except those shown in Table 5-1 1/. Class II salt water areas were not considered in this table.

1/ Source of Classification: Florida Administrative Code, Ch. 17-3

TABLE 5-1. - Lakes, streams, and canals not in Class III fresh water - Kissimmee-Everglades Area

Stream or Lake	Reach	Class	Location By County
Caloosahatchee River	From the east Lee Co. line to Franklin Lock & Dam	I	Lee
Miami River	From Salinity Barrier East 5.7 miles to Biscayne Bay	IV	Dade
Lake Mabel	From Stronahan River to Port Everglades Inlet, South of Pier 66	IV	Broward
M - Canal	From Canal L-8 to Lake Mangonia	I	Palm Beach
Lake Mangonia	All	I	Palm Beach
Clear Lake	All	I	Palm Beach
Canal C-18	All	I	Palm Beach
Lake Okeechobee	All	I	Multi-County

Source: Florida State Department of Pollution Control

The Environmental Protection Agency works closely with the Florida Department of Pollution Control in the administration of water quality standards; administers a federal enforcement campaign against pollution of navigable waters which endangers health or welfare; provides expert technical assistance on difficult pollution problems and supports and encourages the training of much needed manpower for all aspects of water pollution control; and extends financial and other assistance to the State to help strengthen their own water pollution control program.

The Planning Division of the Department of Pollution Control is preparing the State Water Pollution Control Plan in coordination with the Bureau of Water Resources, State Water Resource Plan.

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Department of Health and Rehabilitative Services

Bureau of Sanitary Engineers has the responsibility for controlling public water and sewage treatment development in Florida. The work of the Bureau is carried on through two sections: Waste Water and Water Supply.

The responsibilities of the Waste Water Section include the review of plans and specifications, consultation, evaluation of operators for domestic waste facilities, re-evaluation of existing sewage effluent discharges under the code established by the Department of Pollution Control.

Water Supply Section activities include water works operation surveillance including review of water flouridation programs and common carrier supplies; a program for providing improved water supplies in remote rural communities. The latter program gets financial assistance from the Farmers Home Administration of the U. S. Department of Agriculture. The Water Supply Section carries out a continuing surveillance of herbicide-pesticide impact on public water supply sources. Water supply well construction, public water works operation, public swimming pools and natural bathing places are also responsibilities of the Water Supply Section.

In 1969[1/], 707 sewage projects were designed and approved to provide service for a population of 3.2 million people and 576 water supply projects with a capacity of approximately 70 MGD were approved in the counties within the Basin.

Department of Agriculture and Consumer Services

Soil and Water Conservation Advisory Council acts as an advisory body to the Commissioner of Agriculture. The Council has been delegated certain state responsibilities concerning the Small Watershed Program under Public Law 566. This Council receives and acts on applications; recommends priorities for planning P.L. 566 projects to the U. S. Soil Conservation Service; and reviews the completed P. L. 566 work plan for action of approval or disapproval by the State. A plan of work has been developed by the Board of Supervisors in each district to guide the farm planning and application of practices on cooperator's farms. Their ultimate goal is to complete and apply a soil and water conservation plan on every farm, ranch, grove and watershed in each district.

1/ Source: Florida Department of Natural Resources Report - Kissimmee-Everglades Area

Division of Forestry was reorganized under the Department of Agriculture and Consumer Services with the reorganization act of 1969. This organization was established for the purpose of preventing and suppressing forest fires; providing information on the care and value of forests; enforcing all laws pertaining to the protection of forests and woodlands; encouraging reforestation and good forest management; providing recreation opportunities and research. The Forestry Division participates in the following programs: Cooperative forest management assistance, production and distribution of forest tree planting stock, forest pest control and information and education. These programs are meeting the needs of the rural forestland owners. Other cooperative works include P.L. 566 and River Basin Programs.

Internal Improvement Trust Fund is administered by a Board of Trustees composed of the Governor and the State Cabinet. An executive director appointed by the Governor, with the approval of three members of the Cabinet works directly under the trustees through three divisions: Land Records, Land Management and Field Operations.

The trustees are charged with the management of the titles of all state owned lands. They also manage the titles to and dispose of all Murphy Act lands. An important function of this Agency is the granting of titles to submerged land in tidal water areas, over which upland owners have Riparian rights. The trustees also assist individual county commissioners in setting bulkhead lines; filling operations cannot take place on the seaward side of these lines. Records of state land titles, bulkhead lines descriptions, and dredge and fill permits are valuable in making shoreline development and state land policies.

Institute of Food and Agricultural Sciences of the University of Florida has developed the largest branch experiment station system in the United States. The research, teaching and extension programs have accounted for the success of the program. This has brought about the adoption of new methods, new varieties and new enterprises. The research and development accomplishments of IFAS have served as a foundation for Florida's agricultural industry. The success of Florida agriculture has been aided by the progressive development of the State's water resources relative to conservation, water control, and flood control and the water distribution systems.

The University of Florida has 10 branch experiment stations and 10 field laboratories within the State in addition to the work at the main station at Gainesville. Two branch stations and three field laboratories conducting research projects on the effects of different land treatment measures on the production of agricultural crops and timber are located in the Basin.

Florida Water Resources Research Center is located at the University of Florida in Gainesville and sponsors a variety of research related to the State's water resources. The Center considers the present and anticipated water problems of Florida to be problems of distribution and of preserving the quality of the water supply.

The program of the Center is planned to provide guidance to those entrusted with water management; to establish a basis for decisions in water allocation and diversion; examine ways to decrease water use; and to concentrate on studies toward preventing degradation of the resources in the face of increasing population pressures.

The Center published a progress report dated December 1970 entitled: "An Optimum Water Allocation Model Based on an Analysis for the Kissimmee River Basin (Phase I)"[1/]. This research concerning the optimum allocation of water is being conducted cooperatively with the Central and Southern Florida Flood Control District and uses the Kissimmee River Basin as a pilot study area. The major purpose of this project is to develop and emperically test a model for determining the optimal temperal allocation of water among alternative uses and between watersheds in the Kissimmee River Basin. The procedures for operating the Flood Control District's Water Management System were developed with flood control as the primary purpose. However, flood damage prevention is only one of several water management responsibilities which are recognized by the Flood Control District today. Other responsibilities include water conservation, water supply, prevention of salt water intrusion into the ground water system, preservation and enhancement of fish and wildlife, improvement of navigation and public recreation.

Central and Southern Florida Flood Control District was created by an Act of the Florida State Legislature in 1949. This Act authorized the Flood Control District to cooperate with the U. S. Army Corps of Engineers in the operation and maintenance of project works after they were designed and constructed under the supervision of the Corps of Engineers. The Flood Control District is operating and maintaining a system, in all or part of 18 counties, covering 15,200 square miles. When completed, the District will have approximately 1,500 miles of canals and

1/ Department of Food and Resource Economics in Cooperation with the Central and Southern Florida Flood Control District

levees, eleven pumping stations and over one hundred water control structures. Three large conservation areas covering about 1335 square miles and Lake Okeechobee embracing 742 square miles, have been diked for water storage and conservation.

The primary works of improvements of the Flood Control District include an east coast protective levee extending from the Homestead area north to the eastern shore of Lake Okeechobee near the St. Lucie Canal; three conservation areas for water impoundment in the Everglades area west of the east coast protective levee, with control structures to effect transfer of water as necessary; local protective works along the lower east coast; encirclement of the Lake Okeechobee agricultural area by levees and canals; enlargement of portions of Miami, North New River, Hillsborough and West Palm Beach Canals; enlargement of existing Lake Okeechobee levees and construction of a new levee on the northeast and northwest shore of the lake; increase the outlet capacity for improved control of Lake Okeechobee, (through the Caloosahatchee River and the St. Lucie Canal); and floodway channel in the Kissimmee River Basin, with suitable control structures to prevent overdrainage. See Figure 45 for map of Central and Southern Florida Flood Control District structural measures.

The system is providing flood control by conservation. Instead of channeling surplus flood waters into the Gulf of Mexico by way of the Caloosahatchee River or the Atlantic Ocean by the St. Lucie, Miami, North New River, Hillsborough, and Palm Beach Canals, much of it is pumped into Lake Okeechobee or the conservation areas for future use in dry periods.

The Flood Control Act of 1968 modifies the Central and Southern Florida Flood Control Project with the implementation of the Water Resources Plan for Central and Southern Florida. Approximately 12,000 square miles of the Central and Southern Florida Flood Control District is in this new plan, which embraces 16,000 square miles. The portion of the Flood Control District in the St. Johns Basin is not in the Water Resources Plan.

There are additional areas of the Everglades National Park and the balance of Monroe County and Collier County in the Water Resources Plan that were not in the Flood Control District.

The details of the modification of the Flood Control District's Plan by the Water Resources Plan is discussed under the section- "U. S. Army - Corps of Engineers Projects".

Local Programs

Port Authorities promote the development of ports and harbors in the Kissimmee-Everglades Area. The more active ones are: The Key West Port Authority; the Port of Palm Beach Authority; the Port Everglades Authority; and the Dade County Port Authority. The Marine Council of Greater Miami is also active in promoting various marine activities.

Navigation Districts actively promote their respective waterway projects. The Florida Inland Navigation District (Atlantic Intracoastal Waterway from Jacksonville to Miami - 370 miles); the West Coast Inland Navigation District (Gulf Intracoast north from Ft. Myers Beach to Anclote River - 160 miles); and the Okeechobee Waterway Association (from the Gulf to the Atlantic via Lake Okeechobee - 155 miles); are among the larger navigation projects supported by these districts.

Planning Councils - The East Central Florida Regional Planning Council is engaged in water and related land resources planning. The South Florida Everglades Area Planning Council includes Dade, Broward, Palm Beach, Collier and Monroe counties. The activities of these two councils are coordinated with the local organizations within the individual counties and cities and the Central and Southern Florida Flood Control District. The Flood Control District has a Planning Department; its planning activities are coordinated with local and area planning groups and with state and federal agencies. There are five major cities and twelve counties within the Basin that have local planning agencies.

Drainage Districts - There are approximately 50 Drainage and Water Management Districts in the Kissimmee-Everglades Area. About one half of these Districts are in Palm Beach County covering about 440,000 acres of land. These drainage districts were organized by local groups through local bill Legislative Acts, provided for by the 1913 General Drainage Laws Act. They are governed by boards of supervisors who set the drainage tax assessments needed to operate and maintain districts.

Many of these districts located around the southern end of Lake Okeechobee were organized in the 1920's. Some districts experienced extreme financial difficulties after the devastating hurricanes of 1926 and 1928 and the stock market crash in 1929. Many were reorganized and restructured following these crises and within the last decade several of these districts have paid off their original bonded indebtedness.

S-5A
World's Largest Low-level Pumping Station
(2,160,000 G.P.M.)

CONTROL STRUCTURE S-41

Figure 45

CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL PROJECT

DESIGN AND CONSTRUCTION
BY
U.S. ARMY ENGINEER DISTRICT, JACKSONVILLE
CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

OPERATION AND MAINTENANCE
BY
CENTRAL AND SOUTHERN FLORIDA
FLOOD CONTROL DISTRICT
WEST PALM BEACH, FLORIDA

FEBRUARY 1969

5-71 4-R-30,365

Reproduced by USDA, Soil Conservation Service, Fort Worth, Texas from Corps of Engineers D.O. File No. 400-24,979.
USDA-SCS-FORT WORTH, TEX. 1971

These districts were set up to give positive water control with flood protection to high value vegetable and sugarcane crops. They were generally laid out with main canals and with lateral drains each one-half mile. The main canal channels are pumped to remove flood waters and the areas are protected from outside flooding by a closed system of levees. Some of the districts along the east coast have gravity discharge into the Intra-coastal Waterway or the Atlantic Ocean.

Many of the drainage districts south and east of Lake Okeechobee are protecting agricultural enterprises on subsiding organic soils. They are underlain by limerock and are in need of extensive excavation to regain the needed capacity to give adequate protection. This rock excavation will be an expensive process and many of the districts are applying for financial assistance under the PL-566 Small Watershed Act. There are ten watershed applications already filed for assistance in the area south and east of Lake Okeechobee. Two projects have been planned and are ready for construction.

Soil and Water Conservation Districts are entities of state government and are organized by local referendum under provision of state law. They are directed by local boards of supervisors. They provide local programs of resource planning, development and utilization, and furnish a means for individual local citizens and organized groups to participate in the planning and installation of Soil and Water conservation practices needed to protect and improve the land, water and related resources.

The Kissimmee-Everglades Area has 12 Soil and Water Conservation Districts, six of which are partially covered by the Basin and six which lie completely within the Basin. Collier, Dade and Monroe are the only counties within the Basin, and the State, that do not have Soil and Water Conservation Districts. The Districts within the Basin have 3100 cooperators covering 3,160,000 acres as of June 30, 1968.

Analysis of the 1968 progress reports of the Soil and Water Conservation Districts covering the Basin shows the following:

(1) Fifty-five percent of farm owners and operators are cooperators with a Soil and Water Conservation District

(2) Sixty-four percent of the agricultural farm land is operated by district cooperators.

(3) Seventy-three percent of the cooperators have basic plans covering twenty-nine percent of the agricultural farm land in the Basin.

(4) Twenty-nine percent1/of the cooperators applied one or more conservation practices in 1968. (Does not include reoccurring practices).

(5) Twenty-two percent of the agricultural farm land in the Basin is adequately treated, according to present technical standards.

1/ Due to the high initial cost of land and the need for intensive water management, cooperators install complete conservation practices at the time the farm plan is developed. For this reason, the number of practices reported for an individual year appear to be low.

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S E C T I O N V I

WATER AND RELATED LAND RESOURCE DEVELOPMENT POTENTIAL

Availability of Land for Potential Development

Agricultural Land

Land resources in the Basin, even though subject to limitations and hazards for some uses, are generally suited to the agricultural production necessary to meet projected needs. The soil resources are adequate to meet the Basin's share of projected needs for agricultural products, and to provide for non-agricultural development, provided the works of improvement are installed to remove excess water hazards.

There are 7.24 million acres of agricultural land in the Basin, of which 4.9 million acres are in soil capability sub-classes IIIw, and IVw (Figure 46). The dominant hazard of these soils is excess water. This should not be interpreted as "wet lands" such as marshes and sloughs. These are largely flatwoods type soils with high water tables. If crops or orchards, requiring moderately deep root zones are to be successful, some type of internal drainage is essential. Native range, forest and grass pasture can be grown on a marginal basis, with minimum drainage.

By 2020, 4.1 million out of 6.0 million acres of agricultural land will be in soil capability sub-classes IIIw and IVw. In order for the Basin to produce the projected commodities from the available agricultural land, water management projects (drainage and irrigation) are essential.

Temperature is not a major limiting factor in the production of citrus and vegetables in the Basin. However, due to competition from other areas of the country during warm seasons of the year, the majority of vegetables in Florida are grown south of Lake Okeechobee in the winter months, where the warm climate (due partly to the influence of the Lake) gives this area an advantage over other vegetable producing areas.

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The majority of the agricultural area south of Lake Okeechobee is on organic soils. Projections indicate that, of the approximately 500,000 acres of organic soils, over two feet deep in 1970, only 40,000 acres of this depth will be available by 2020. This will necessitate the relocation of agricultural production to mineral soils which may not have the same favorable climatic advantage as the organic soils. As this shift to new areas takes place, additional water management facilities will be required.

Forestland

The total forestland acreage is expected to decline slightly (6700 acres) by 1980 due to urban expansion and highway construction. Most of the acreage loss will be from non-commercial forestland as commercial forestland will only be reduced by an estimated 1900 acres.

Rapid urban expansion is expected to accelerate the rate of decline in the forestland acreage after 1980. By 2020, the forestland acreage is projected to be approximately 1.5 million acres of which about 1.1 million acres will be classified as commercial (Table 6-1).

TABLE 6-1.- Present and projected forestland acreages - Kissimmee-Everglades Area

Year	Commercial	Non-Commercial	Total
	1000 Acres		
1968	1188.7	804.7	1993.4
1980	1186.8	800.0	1986.8
2000	1137.4	755.6	1893.0
2020	1055.0	438.3	1493.3

Sixty percent (730,300 acres) of the present commercial forestland acreage, has a high potential for the production of pine, while 58,700 acres have a low potential due to lack of fertility and moisture holding capacity. Excess surface water needs to be removed from the remaining 399,700 acres to increase their potential.

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Agricultural Land by Soil Capability Classification
Kissimmee–Everglades Area

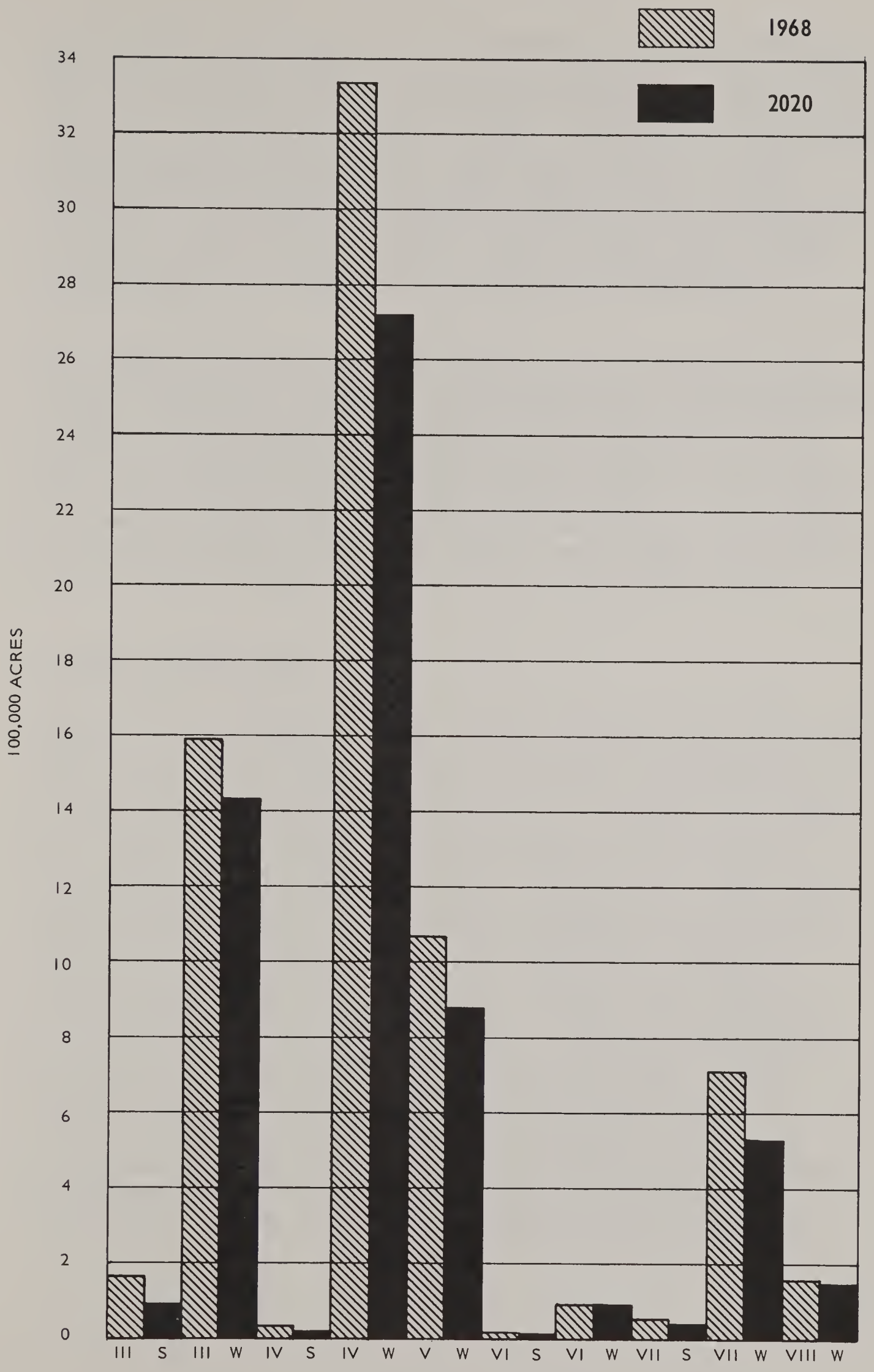

Figure 46

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An estimated 10 percent of wet forestland soils have adequate water control at present. Large landowners have accomplished most of the control through projects designed to develop citrus groves and improved pasture. By 1980, 50 percent of wet forestland soils will have the water control necessary to reach their maximum potential production. This water control is also expected to be completed by large landowners who will make use of outlets used to remove water from cropland areas or from non-agricultural areas. Between 1980 and 2020 water control is expected to be extended to include two-thirds of wet forestland soils.

With better management, a much higher rate of growth on pine could be achieved on commercial forestland soils (See Appendix). By 2020, net annual growth exceeding 100 cubic feet per acre per year is anticipated from planting and seeding to obtain more fully stocked stands, removing excess water, and putting into practice knowledge obtained through research. This rate of growth, though high, is reasonable when the possibilities of increased growth rates from genetic improvement and fertilization could be common practice by the end of the century.

Non-Agricultural Land

Land used for non-agricultural purposes has increased very rapidly in recent years. Much of this has been for residential areas but large acreages are also being used for industrial expansion, highways, recreation and tourist complexes. Reports of real estate transactions involving ten to fifty thousand acres have become common during the course of this study. New cities are being planned in and near the Basin that will increase the demands for residential development. The large growth in population, the attractive climate and expanding employment opportunities will create additional demands for land for non-agricultural purposes. Disney World and its related development is expected to utilize a large amount of the land formerly used for agriculture in the northern part of the Basin. Very little land is expected to be used for farming in Lee, Dade and Broward counties in 2020. As a result of the rapid developments affecting land use, the projections of land available for agriculture in 2020 were revised downward during the course of this study. Land used for non-agricultural purposes is expected to increase from 2.8 million in 1968 to 4.1 million acres in 2020 (Figure 47).

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These developments and their associated population increases place additional demands upon the natural resources of the Basin, including increased demands for water for municipal and industrial uses, additional drainage and flood protection, waste disposal facilities and pollution abatement. These developments in many cases compete with agriculture for labor and land in that the land best suited for agriculture may also be most desirable for residential development because of its location and physical characteristics.

Impoundments

The topography of the Basin is generally such that the construction of dams and reservoirs is impracticable. However, at some future time it may be practical to provide additional capacity on Lake Okeechobee, Lake Istokpoga, and on some of the lakes in the Kissimmee River chain. This capacity could be provided by increasing the height of existing dikes or the construction of new dikes.

Ground Water Developments

Wells

There are areas within the Basin with potential for development of large quantities of fresh water from wells. North of Lake Okeechobee, the Floridan Aquifer has good quality water that in many areas has been virtually untapped. This is a source that is partially replenished each year through recharge although the annual rate may vary. The amount of water available in one area may depend on the amount of water removed from the Aquifer between the recharge area and the point of removal.

Recharge

The Basin has low potential for groundwater recharge development and therefore it is very important that the existing recharge areas be maintained. Urbanization and other developments are encroaching on some of the recharge areas. Consideration has been given to pumping fresh water into the Aquifer during periods of excess and then withdrawing it during drought periods. This technique may be possible in areas where the Aquifer is too saline for general use. The fresh water tends to form a pocket above the saline water. This fresh water can later be withdrawn without excessive mixing of the different quality waters if the system is carefully monitored. This procedure is still in the experimental stage in Florida, but apparently has been used successfully in other locations.

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Non-Agricultural Land by Soil Capability Classification

Kissimmee-Everglades Area

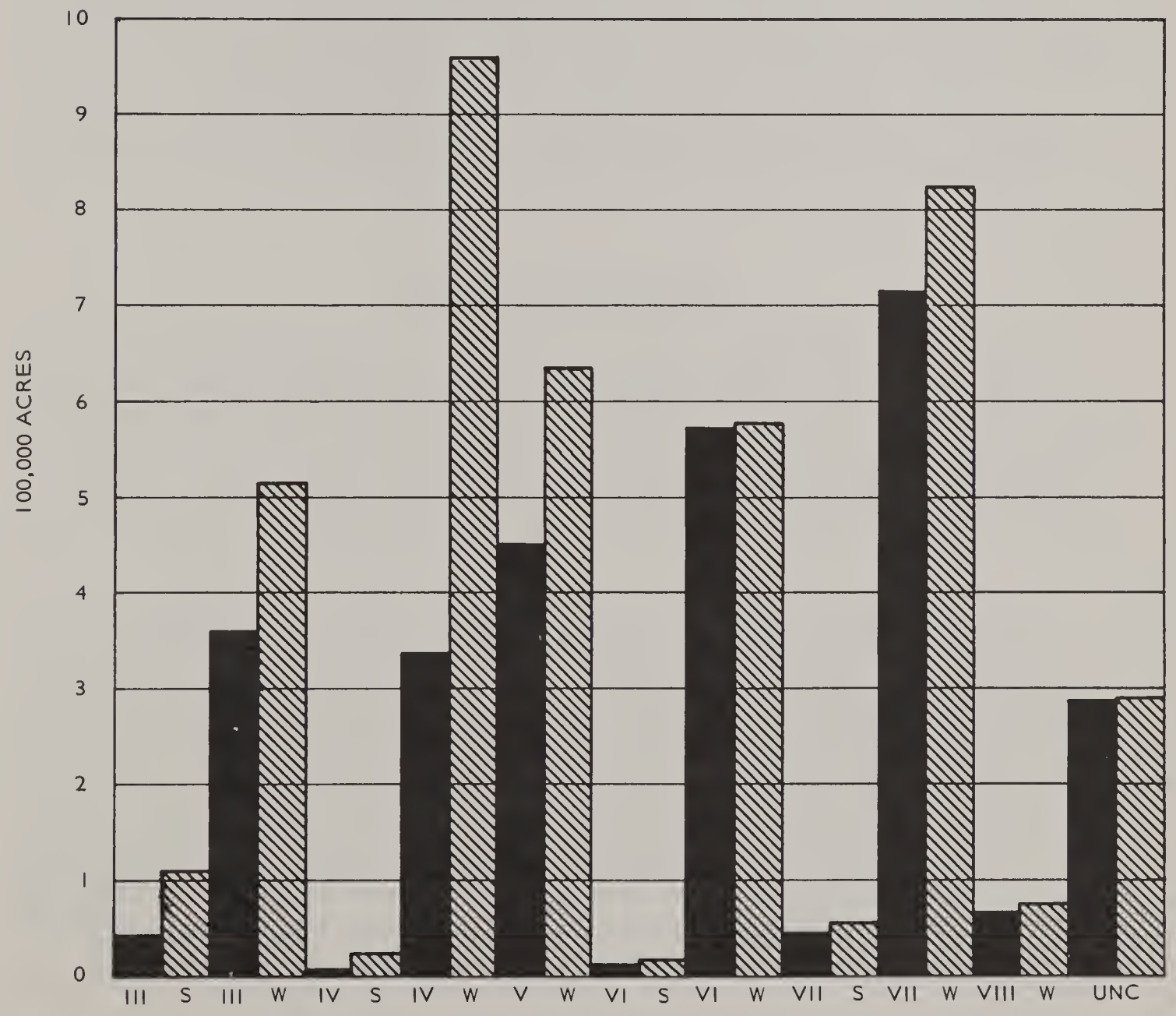

Figure 47

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Water Quality Control

Water quality has received more attention in recent years than in the past. People are no longer willing to degrade water quality in the name of progress. The majority now feel that it is possible to have progress without sacrificing the quality of our water resources. Every effort must be made to eliminate present and future sources of pollution as the Basin develops.

Cattle feed lots, dairies and holding pens are a source of agricultural pollution to the Basin's lakes and streams. Many of these problem areas have been corrected by the installation of waste treatment lagoons where aerobic and anærobic treatment removes the majority of pollutants. The remaining effluent can be spread on the land where the soil organisms and plants utilize most of the remaining pollutants.

There is potential for developing the shallow aquifers to a greater extent than has been done in the past. This could be accomplished by the use of injection wells along the coast to build up a buffer of fresh water to prevent salt water intrusion due to underground movement of saline ocean waters. Under this system, it would be possible to withdraw more water from the shallow aquifer in areas away from the coast and still prevent salt water intrusion from the inland movement of saline water.

Channel Improvement

The Basin has about 50 drainage or water management districts. Most of these systems began in the late 1920's and have been operated on a maintenance basis. They usually have the potential to adequately manage the water because most districts have main channels, pumps and lateral canals at one-half mile intervals. Many of the districts are in need of major rehabilitation, both pumping plants and canal systems.

The drainage districts south and east of Lake Okeechobee are on organic soils which are underlain with limestone. These soils are subsiding at the rate of about one foot in ten years. The initial design capacity of the channels in these districts was usually at about 3/4 inch per day. This design removal rate was adequate because large portions of the districts were in raw everglades. The usual maintenance on these channels has kept up with the declining capacities by widening the channels. Most of the districts are in need of profile drainage and water control can be accomplished only by

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deepening the channels. This will be a very expensive process since about 80 percent of the excavation will be in limestone rock which requires blasting. The districts are usually leveed for protection from outside flooding and pumps are used to discharge into the major outlet canals. The pumping plants usually need up-dating because they are required to operate at higher heads than originally designed, making plant operating efficiencies off peak performance. Most of the pumps are under the needed capacity since most of the land within the districts has been developed.

Most of the drainage and water management districts within the Basin rely on the primary canal system of the Central and Southern Florida Flood Control District for discharge outlets, (Figure 45). The Central and Southern Florida Flood Control District is in the final stages of completing a plan that would regulate Lake Okeechobee from 15.5 to 17.5 MSL. This system will need almost constant updating because of the almost total development of the everglades agricultural area and the urban pressures from development along the lower east coast. There is also a need to capture and store larger quantities of water that are now discharging to salt water.

Recreational Development

The recreation potential for the upper part of the Basin is lake-oriented while the southern portion depends upon canals. The major recreational developments are the Everglades National Park and eight State Parks having a land area of 940,000 acres. These parks provide most of the family-type outdoor recreation such as camping, picnicking, sightseeing and nature study. In addition, the Central and Southern Florida Flood Control District maintains 6 recreation areas, 10 parks and 28 access areas. Many of these areas are small and serve mostly boaters and fishermen. There are twelve additional State Parks proposed and the Central and Southern Florida Flood Control District has 21 more areas to develop (Figure 48 and following pages).

The three water conservation areas, with a combined area exceeding 860,000 acres, are primarily water and marsh with occasional tree islands. They support large fish and wildlife populations but have little potential for multi-purpose, family-type recreational development. Visitation changes with fluctuations in the water level. Airboat rides are popular and enable visitors to observe birds and wildlife that cannot be reached by other types of transportation. Other recreation uses are fishing, hunting, frogging and nature study.

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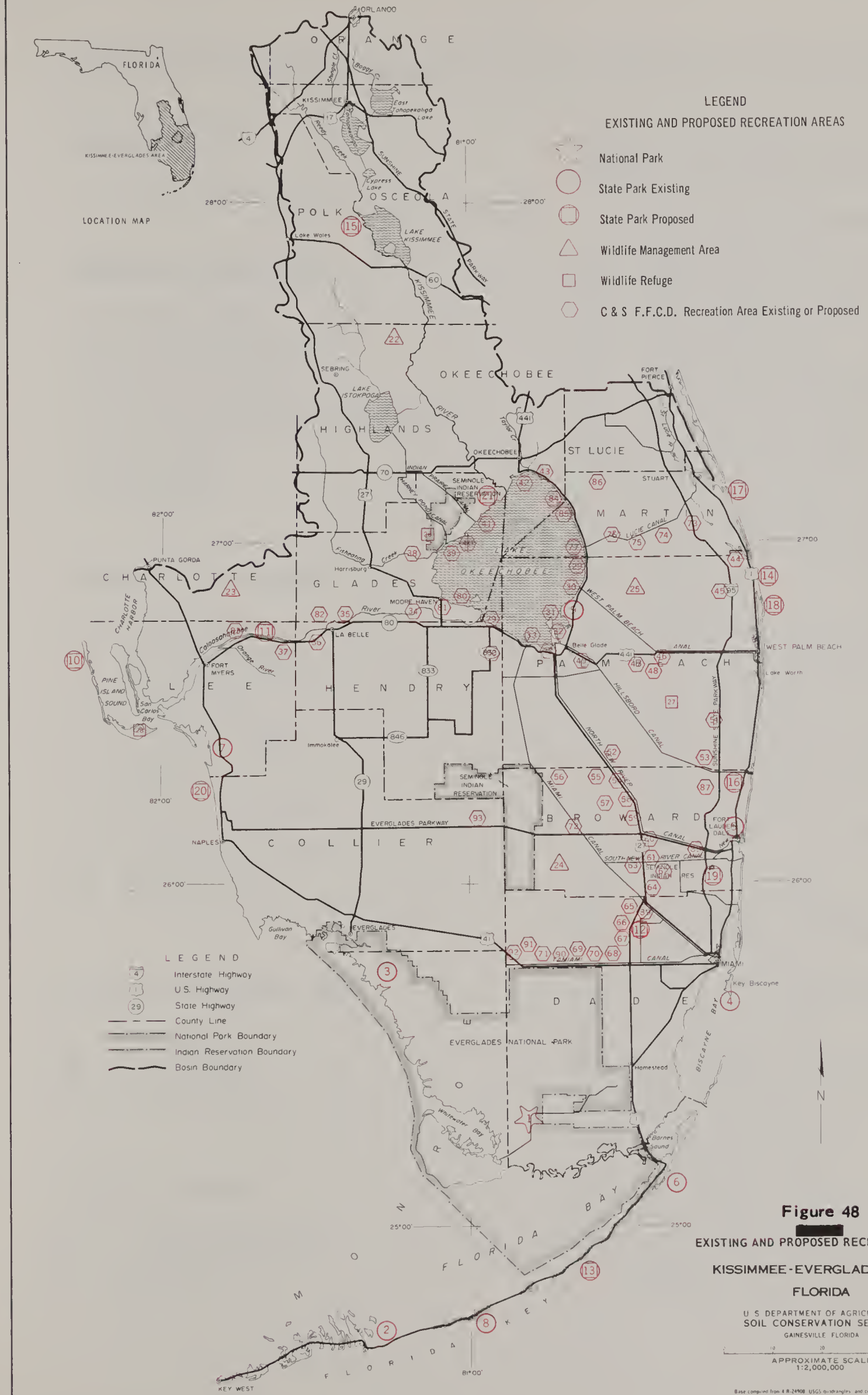

Figure 48

[redacted]

EXISTING AND PROPOSED RECREATION AREAS

KISSIMMEE-EVERGLADES AREA

FLORIDA

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
GAINESVILLE, FLORIDA

5-71 4-R-30,471

USDA SCS-FORT WORTH TEX 1971

May 1971

4-R 24908-A

Existing and Proposed Recreation Areas - Kissimmee-Everglades Area

National Park

1. Everglades National Park

Existing State Parks

2. Bahia Honda
3. Collier Seminole
4. Cape Florida
5. Hugh Taylor Birch
6. John Pennekamp Coral Reef
7. Koreshan
8. Long Key
9. Pahokee

Proposed State Parks

10. Cayo Costa
11. Caloosahatchee
12. Grossman Hammock
13. Indian Key
14. Jupiter Inlet
15. Lake Kissimmee
16. Lakeview
17. St. Lucie Inlet
18. Singer Island
19. Topeekeegee Yugnee
20. Wiggins Pass
21. Northwest Lake Okeechobee

Wildlife Management Area

22. Avon Park
23. C. M. Webb
24. Everglades
25. J. W. Corbett

Wildlife Refuge

26. Fisheating Creek
27. Loxahatchee
28. Sanibel

Central & Southern Florida Flood Control District Recreation Areas

Existing or Proposed

29. Sand Cut Access Area
30. Canal Point Access Area
31. Rardin Park
32. Belleglade Park
33. Lake Harbor Access Area
34. Ortona Lock Recreation Area
35. Labelle Access Area
36. Denaud Access Area
37. Alva Access Area
38. Fisheating Creek Access Area
39. Harney Pond Canal Access Area
40. Dyess Ditch Access Area
41. Indian Prairie Canal Access Area
42. Okeechobee Access Area
43. Taylor Creek Access Area
44. State Road Department Wayside Park
45. State Road Department Wayside Park
46. State Road Department Wayside Park
47. Twenty Mile Bend Recreation Area
48. L-8 Access Area
49. Six Mile Bend Access Area
50. State Road Department Wayside Park
51. Loxahatchee National Wildlife Refuge Recreation Area
52. L-6 Access Area
53. Loxahatchee Recreation Area
54. State Road Department Wayside Park
55. S-150 Access Area
56. L-5 Access Area
57. L-38 Access Area
58. S-11C Access Area
59. S-11A Access Area
60. Sawgrass Recreation Area
61. Andytown Access Area

Central and Southern Florida Flood Control District Recreation Areas
(Continued)

62. State Road Department Wayside Park
63. Everglades Holiday Park
64. State Road Department Wayside Park
65. Krome Avenue Access Area
66. Trail Glades Access Area
67. L-31 Access Area
68. Tamiami Trail Fish Management Area
69. S-12E Access Area
70. S-12C Access Area
71. S-12D Access Area
72. Alligator Alley Access Area
73. St. Lucie Lock - Phipps Park
74. S-203 Access Area
75. S-206 Recreation Area
76. S-200 Access Area
77. Port Myaca Park
78. South Bay Recreation Area
79. Clewiston Recreation Area
80. Moore Haven Lock Park
81. Lake Hicpochee
82. Labelle Park
83. Olga Lock Recreation Area
84. Nubbin Slough Access Area
85. Chancy Bay Access Area
86. S-215 Access Area
87. Cypress Creek Park
88. Bombing Range Park
89. Canal 9 Park
90. Canal 38 Recreation Area
91. Structure 12A Access Area
92. Levee 28 Access Area
93. Canal 37 Recreation Area

Source: Water Resources Report for Central and Southern Florida Appendix H - U. S. Army Corps of Engineers - 1968

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Current hunting and fishing demands are being met on undeveloped land, wildlife management areas, water conservation areas, lakes, streams and canals. More campgrounds and picnic areas around Lake Okeechobee and around areas of rapid urbanization are needed to meet future recreation demands.

Improved technology is expected to increase yields of agricultural crops thus releasing some areas for recreation and wildlife. An early subsidence of some of the shallower muck soils will cause a shift of crops from muck to mineral soils. The former muck area would be used for water storage and recreation. Undeveloped land, suitable for recreational development, is available but land prices are high and public agencies must compete with urban developers to obtain needed areas. It is important that areas having value as a recreation resource be obtained before they are destroyed by other land users. Landowners should be encouraged to develop portions of their land for public recreation by legislation to reduce liability risks to landowners, improvement in the market for trespass rights, education, direct subsidies to landowners, and public purchase of trespass rights.

In 1965, there were 150 million user-occasions of outdoor recreation. Fishermen and hunters accounted for about nine percent of the total of which less than one percent were hunters. By 1980, 300 million are expected with the number of user-occasions increasing to 500 million by 2000. Beyond 1980, demands for hunting and fishing can be met even though undeveloped land is decreasing by intensifying the use and improving the management of public areas. However, large investments will be required to meet future needs for multi-purpose, family-type recreation. The development of campgrounds in connection with motel operations will help meet this demand. When considering needs for water, all water-oriented recreationists should be considered important water users.

Fish and Wildlife Development

There are four public wildlife management areas with a combined acreage of over 980,000 acres. Three are mostly land areas containing 223,000 acres and the remaining acreage is in Conservation Areas No. 1 and No. 2. The former areas, managed for the production of game animals and birds have a greater potential and will respond to more intensive wildlife management of a more multiple-use nature. New techniques gained through research can be put into practice and law enforcement can be intensified, with added funding. There are possibilities for development of waterfowl habitat in connection with water management to reduce

surface water and improve access. Conservation areas No. 1 and No. 2 have the potential for further development for both fish and wildlife. Studies being conducted on the vegetation should be helpful in managing the area more effectively and achieving higher rates of production.

The fisheries resource can be further developed in the existing canals and those to be added to the system. These canals are accessible and will continue to be heavily used by bank and other types of fishermen. Several species of fish thrive in the waters of these canals and greater production can be obtained from additional water areas and more emphasis on fish management.

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S E C T I O N V I I

OPPORTUNITIES FOR DEVELOPMENT AND IMPACTS OF USDA PROGRAMS

Development Opportunities

Land Treatment Programs

On-going conservation programs can contribute to the development and improved use of soil resources. Of the 7.24 million acres of land used for agriculture in 1968, 0.27 million acres (4 percent) are well drained to moderately well drained soils but have problems of inherent low fertility, erosion, or root-zone limitations due to shallow soils or low moisture-holding capacity. Over the next 10 to 15 years these soils will need conservation treatment including continuation of present conservation practices. Projections indicate by 2020 this acreage will be about three percent of the 5.98 million acres of agricultural land.

In 1968, the land use inventory indicated 6.96 million acres, or 96 percent of the total agricultural land has excess water as the dominant hazard. The Inventory showed that 1.56 million acres were under drainage projects of which 0.44 million acres were adequately drained and 1.02 million acres under irrigation. The Basin's total accumulated land treatment practices for agricultural water management, done by all agencies and private sectors, reported[1/] as of July 1968, 96,300 miles of mains and laterals (including field ditches), 5,200 grade stabilization structures, 1800 miles of dikes and levees, 2000 pumping plants, 57,000 water control structures, 1600 irrigation systems and 1800 farm ponds. The above agricultural water management practices were installed on 1.9 million acres of citrus, other crops and improved pasture.

Land use projections for the immediate future (1980) indicate only minor increases in the acreage needed for citrus, other crops and pasture. The increased production can be accomplished by advancements in technology, including agricultural water management with only minor acreage increases.

1/ Soil Conservation Service District records of practice done by all sectors provided they meet SCS standards, as of July 1, 1968.

The future (2020) agricultural projections indicate that an additional 670,000 acres will be needed for "other crops" and improved pasture. This is an acreage increase of 35 percent from 1968 to 2020. Most of this increase will be used for improved pasture and will come from native range. It was assumed that land treatment measures will increase by 15 percent to accomodate the increase in yields due to technological advances.

Land treatment practices to reduce hazards of excess water can be partially implemented through current programs which offer assistance to individual farmers and ranchers. But, in order for farmers' and ranchers' on-farm water management to be effective in developing soil and water resources to their full potential, group programs of flood prevention and drainage must be intensified. These group projects will be necessary to establish common outlets for water management because land ownership patterns often block individual development.

Cooperative State-Federal Forestry Programs

Of the 161,000 acres of forestland not under fire protection, about one-third is classified as commercial, the remainder is non-commercial. Forest management practices could be improved if public fire protection programs were implemented since the risk of private investments required would be reduced. With controlled burning, more consistent, and faster growth of wood products could be sustained on the commercial forestland. With the proper use of fire, the non-commercial forestland has a greater potential for non-timber uses, such as watershed protection, wildlife habitat, outdoor recreation and natural beauty. The level of fire protection that exists in protected areas would be adequate for all anticipated uses of this forestland.

State and federal forestry agencies could contribute to increased use and productivity of forestland through their cooperative programs. An urban forestry program in the cities would assist a large segment of our population by protecting their trees from pests and by growing stands of trees for shade, beautification, noise abatement, open space enhancement and outdoor recreation.

Slightly over one-half of the 1,188,700 acres of commercial forestland is in public and corporation ownerships. Progress is being made in forest management and a higher level of management can be expected during the next decade. The remaining forestland is in non-industrial private ownerships, including

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many small landowners. Much of it is poorly stocked and producing only half of its potential. The chances of improving the level of forest management of these areas are very remote unless some special incentive program is initiated. Substantial investments are needed to increase the production on these lands to their potential capacity. Incentives above the present level of cost sharing could stimulate the development of forestland to satisfy increasing demands for wood products. Higher rates of cost sharing could be offered to landowners for those multi-purpose forest management measures that benefit the public more than the landowner. Included would be practices for recreation, wildlife, erosion control and beautification.

The projected demand for wood products by 1980 will be about 54 million cubic feet at which time there will be approximately 1,186,000 acres of commercial forestland. To meet this need, which is the Basin's share of the National demand, growth rates on forestland must be doubled. If an accelerated program of planting and timber stand improvement is initiated immediately, timber production goals could be met with the additional growth from these operations.

Before 1980, 389,700 acres of cut-over and poorly stocked commercial forestland should be planted and 142,400 acres treated with timber stand improvement measures at an annual cost of $1.1 million or a total cost of $9.1 million. Additional stumpage values resulting from these expenditures will be $2.8 million annually, by 1980. Forestland areas on the most productive soils should be treated in order to increase growth rates as rapidly as possible.

The projected demand for wood products will be 164 million cubic feet by 2020, by which time the area of commercial forestland will have been reduced to 1,055,000 acres. Between 1980 and 2020, 369,900 acres of cut-over and poorly stocked commercial forestland should be planted and 284,800 acres treated with timber stand improvement measures. Seedlings grown from superior tree seed sources should be planted which will grow 10 to 15 percent faster than ordinary planting stock.1/ Six hundred and fifty thousand acres of forestland on the better drained soils should be fertilized, after the trees are 15 to 20 years of age. The total cost of these operations is estimated to be $28.2 million, with an annual cost of $704,500 producing 30.7 million cubic feet of

1/ 1969 DARE Report, University of Florida, Institute of Food and Agriculture Science.

additional growth. The net annual growth can be expected to be 111.7 million cubic feet by 2020, leaving a shortage of 52.3 million cubic feet. This amount would have to be supplied from areas outside the Basin.

The forest management program includes current and accelerated programs of forestland development, considered essential in meeting the projected demands for timber products by 1980 and 2020, (Table 7-1). Forest fire protection should be extended to cover the Basin. More technical assistance to landowners is recommended to: (1) reduce waste through better utilization and marketing of harvested products, (2) keep damage to the environment to a minimum on all forest management operations (3) service an urban forestry program including assistance to urban planners and developers, and (4) improve harvesting practices by proper location, construction and maintenance of logging roads and skid trails. A timber development organization would assist small landowners in disposing of harvested wood products. Larger acreages of site preparation, planting and timber stand improvement are recommended for each time frame.

Forest fertilization is recommended as a means of obtaining maximum growth rates. Present studies indicate that some increases in wood production will result from fertilization during the 1970's. After 1980, additional knowledge obtained by research on the use of fertilizer should enable land managers to produce yields 10 to 20 percent higher than anticipated from both genetic improvement and intensive site preparation. Only 68 percent of the 2020 demands for timber products can be met on the reduced acreage of commercial forestland. Future technology, developed through research, may reduce the drain on timber resources by increased utilization, more efficient uses of wood in construction, increased re-use of paper and wood residue and use of wood substitutes.

Figure 49 shows the supply and demand of wood products in 1968 and the projected amounts for future years under the present level of forest management and with an accelerated forestry program.

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Supply and Demand – Wood Products
Kissimmee–Everglades Area

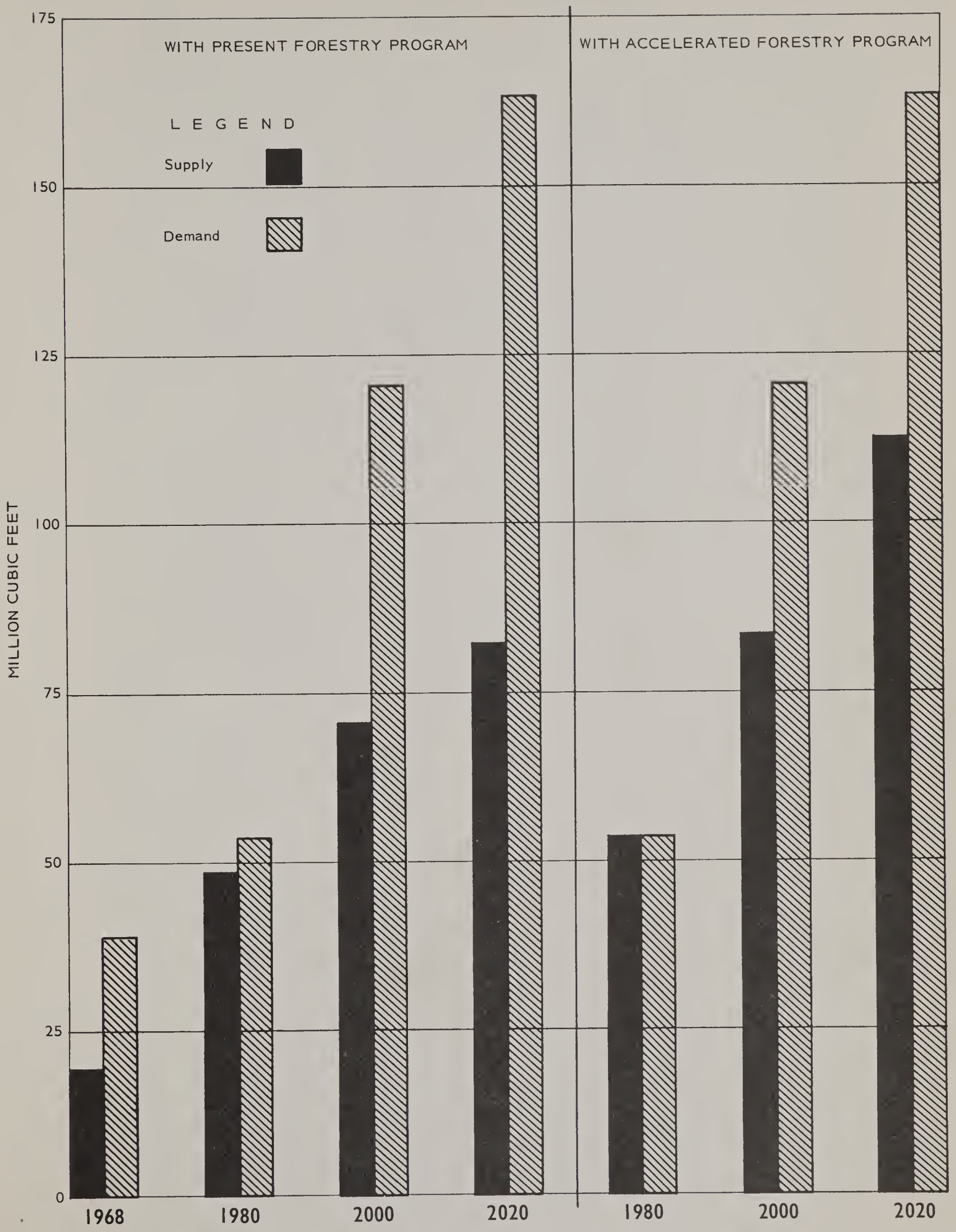

Figure 49

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TABLE 7-1. - Forest management program, Kissimmee-Everglades Area - 1968 to 2020

Forestland Treatment Measure	With Current Programs		Additional with accelerated program		Needs met with accelerated program (percent)	Annual cost of accelerated program (dollars)
	1000 Acres	Percent	1000 Acres 1968-1980	1980-2020		
Fire Protection	1832.4	92	161.0	-	100	51,359
Improved utilization, marketing and harvesting	517.1	44	669.7	-	100	677,141
Planting, including site preparation	6.3	2	383.4	-	100	639,000
				363.6	68	218,160
Timber Stand Improvement			142.4		100	118,667
				284.8	68	85,440
Fertilization				650.0	68	400,900

Potential P.L. 566 and other Watershed Projects

The most efficient use of land and water resources of the Basin for immediate needs (1980) and future needs (2020) for agricultural products will require the installation and management of major and secondary works of improvements. These improvements will be needed to reduce hazards and limitations associated with the agricultural use of the resources. Reducing the damaging effects of floodwater and replacing or maintaining soil moisture at desirable levels of optimum plant growth during periods of deficient rainfall - along with conservation land treatment measures are important items of consideration.

The Basin was subdivided into 126 planning units. The subdivisions are identified by name and number in Table 7-2 and by location on Figure 50.

The development of the soil and water resources on a planning unit (small watershed) basis offers communities an excellent opportunity to solve soil and water problems in a coordinated manner.

All of the planning units are under 250,000 acres required by Public Law 566 criteria, except 50, 57, 103 and 121. These units are Lake Okeechobee, Charlotte Harbor, Conservation Area 3-A and the Everglades National Park respectively. Units 83, 95 and 104 are conservation areas also. They are comprised of large bodies of water or wildlife areas. Units 123 and 124 have limited drainage problems because surface water drains vertically through the porous limerock.

It is not considered feasible to provide facilities that will eliminate all flooding, but rather the channels are designed to remove the floodwaters within a period of time compatible with the tolerance of the crops being grown.

All 126 planning units were evaluated to determine the technical and economic feasibility of providing works of improvement for the purposes of flood prevention, and agricultural water management for the immediate future (1980). Seven units, and part of another unit have completed P.L. 566 plans. There are applications for P.L. 566 plans covering five planning units and parts of three other units.

The economic evaluation for 1980 indicated that 15 planning units will have favorable benefit-to-cost ratios of 1:1 or better. This evaluation is based on a project life of 50 years, interest rate of 5 3/8 percent. Six units will be marginal with ratios of 0.8 to 1 or higher and 97 units were found to be infeasible.

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LOCATION MAP

LEGEND

- Interstate Highway
- US Highway
- State Highway
- County Line
- National Park Boundary
- Indian Reservation Boundary
- Basin Boundary
- Planning Unit Boundary and Number

N

Figure 50

[redacted]

PLANNING UNIT LOCATION MAP
KISSIMMEE-EVERGLADES AREA
FLORIDA

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
GAINESVILLE FLORIDA

APPROXIMATE SCALE
1:2,000,000

Base compiled from 4 R 24908 USGS quadrangles and county highway maps
All planimetric detail taken from these sources

5-71 4-R-30402

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May 1971

4 R-24908-A

TABLE 7-2.- Index of Planning Unit names and numbers - Kissimmee-Everglades Area

Name	Planning Unit No.	Acres
Reedy Creek	1	118,000
Shingle Creek	2	110,100
East Lake Tohopekaliga Boggy Creek	3	84,200
Lake Hart	4	65,500
Lake Tohopekaliga	5	81,200
Alligator Lake	6	68,800
Lake Marion Creek	7	75,800
Lake Hatchineha	8	24,000
Cypress Lake	9	27,600
Canoe Lake	10	20,400
Catfish Creek - Lake Pierce	11	55,100
Lake Rosalie	12	65,500
Lake Kissimmee	13	101,900
Lake Marian	14	54,900
Lake Wales	15	8,200
Lake Weohyakapka - Tiger Creek	16	58,500
Crooked Lake	17	43,100
Lake Arbuckle	18	74,100
Buttermilk - Ice Cream Slough	19	52,300
Blanket Bay Slough	20	48,400
Middle Arbuckle Creek	21	73,700
Fort Kissimmee	22	52,300
Pine Island Slough	23	103,200
Carter Creek	24	29,600
Lower Arbuckle Creek	25	35,500
Upper Josephine Jackson	26	44,200
Lake Istokpoga	27	75,300
Fort Basinger-Cornwell	28	35,900
Oak Creek	29	24,900
Basinger	30	88,800
Fisheating Creek Marsh	31	53,200
Lake Placid West Chain of Lakes	32	30,400
Lake Placid East Chain of Lakes	33	11,800
Istokpoga Marsh	34	27,800
C-41-A	35	47,600
Long Cypress Slash	36	10,900
Yates Marsh	37	29,900
Popash Slough	38	18,000
Taylor Creek	39	83,300
Cow Creek	40	60,300
Rim Ditch - Diversion Canal	40A	46,900
N. St. Lucie River Drainage District	41	67,700

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TABLE 7-2.(Cont.) - Index of Planning Unit names and numbers

Name	Planning Unit No.	Acres
St. Lucie River	42	106,500
Cypress Creek	43	40,600
Upper Fisheating Creek	44	64,600
Middle Fisheating Creek	45	75,100
Lower Fisheating Creek	46	102,400
Harney Pond Canal	47	100,100
Indian Priarie Canal	48	55,000
Lower Kissimmee River	49	28,200
Lake Okeechobee	50	557,600
Nubbin Slough	51	34,500
North Allapattah Flats	52	64,700
Barley Barber Swamp	53	31,700
South Allapattah Flats	54	102,200
South Fork St. Lucie River	55	77,600
Northwest Fork Loxahatchee River	56	76,700
Charlotte Harbor	57	346,100
Trout Creek	58	93,300
Telegraph Swamp	59	76,400
Jack's Branch	60	54,600
Bee Branch	61	55,600
Chaparral Slough	62	48,800
Moore Haven	63	43,600
Clewiston	64	67,900
South Florida Conservancy District	65	44,400
Belle Glade East	66	36,000
West Palm Beach Canal	67	137,000
J. W. Corbett Wildlife Management Area	68	108,700
Loxahatchee Slough North	69	72,000
Juno Beach	70	23,900
Loxahatchee Sub-Drainage District	71	57,400
Loxahatchee Slouth South	72	56,000
Fort Myers	73	110,900
Orange River	74	87,800
Townsend Canal	75	77,400
LaBelle	76	43,200
Long Hammock Creek	77	99,500
Hendry Marsh	78	51,800
Devil's Garden Slough	79	90,100
Vaughn	80	58,100
Okeelanta	81	61,200
Brown's Farm	82	84,300
Conservation Area No. 1	83	142,000
Lake Worth (Lake Worth-Acme D.D.)	84	57,400
Boynton (Lake Worth D.D.)	85	59,300

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TABLE 7-2.(Cont)- Index of Planning Unit names and numbers

Name	Planning Unit No.	Acres
Beverly Beach (Lake Worth D.D.)	86	50,000
Estero & Imperial Rivers	87	115,100
Corkscrew Marsh	88	156,600
Okaloacoochee Slough	89	120,000
Dinner Island	90	83,600
Kissimmee Billy Strand	91	72,800
Big Cypress Reservation - East	92	91,400
Canal L-27	93	126,300
Greenfield-Shawano D.D.	94	79,200
Conservation Area No. 2A	95	104,500
Boca Raton (Lake Worth-Acme D.D.)	96	58,300
Naples	97	60,800
Big Cypress Swamp	98	57,700
Camp Keals Strand	99	50,700
Sunniland West	100	69,100
Deep Lake Strand	101	149,400
Big Cypress Reservation - West	102	134,700
Conservation Area No. 3A	103	482,100
Conservation Area No. 2B	104	27,600
Pompano	105	62,400
Middle River (Ft. Lauderdale)	106	30,500
New River (Ft. Lauderdale)	107	31,300
Royal Palm Hammock	108	102,000
Big Cypress Bend	109	71,000
Ochopee	110	76,900
Turner River	111	79,200
Moore Station	112	116,600
Conservation Area No. 3B	113	99,400
Cooper City	114	51,400
Davie	115	19,700
Hollywood	116	24,800
Marco	117	123,300
Trail City	118	210,500
Snapper Creek Canal	119	141,500
Miami	120	182,200
Everglades National Park	121	1,132,400
Lake Chekika	122	124,300
Black Creek	123	64,100
Homestead	124	195,800
Florida Keys	125	125,000
Total Land and Water		11,305,200

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Proposals for agricultural development consistent with national economic development were evaluated on the basis that works of improvement would be designed and installed with sufficient capacity to give the desired protection for the projected use of the soil resources. The evaluation indicated that 33 additional planning units which were infeasible or marginal in 1980 would have favorable benefit-to-cost ratios of 1 to 1 or better by 2020. Of the remaining 64 planning units infeasible or marginal in both 1980 and 2020, six units are involved in large water storage or open wildlife areas, fifteen are dominated by urban areas, and 20 units have relatively insignificant sources of potential agricultural problems. This preliminary analysis indicates that 23 units involving moderate amounts of agricultural improvements would remain infeasible for project action by 2020.

Results of the evaluation of feasible planning units found to be needed by 1980 and 2020 are shown in Tables 7-3 and 7-4 respectively and Figure 51.

TABLE 7-3.- Benefits and costs for feasible planning units to meet immediate needs- Kissimmee-Everglades Area (1980)

Planning Unit Number		Total Annual Cost	Total Annual Benefits[1/]	Total Acreage Land & Water	Ratio Benefits To Costs
		1000 Dollars		1000 Acres	
51		38.9	63.5	34.5	1.6:1
58		186.7	229.1	93.3	1.2:1
64		435.5	434.6	67.9	1.0:1
66		242.3	471.9	36.0	1.9:1
67		922.9	1653.8	137.0	1.8:1
75		219.0	213.3	77.4	1.0:1
76		107.6	105.7	43.2	1.0:1
80		434.8	764.4	58.1	1.8:1
81		457.8	880.5	61.2	1.9:1
82		630.7	1136.3	84.3	1.8:1
86		241.8	237.8	50.0	1.0:1
93		607.5	776.2	126.3	1.2:1
94		508.2	545.4	79.2	1.1:1
96		193.5	187.5	58.3	1.0:1
107		42.5	119.9	31.3	2.8:1
			Marginal Units		
27		106.5	82.6	75.3	0.8:1
84		194.4	145.6	57.4	0.7:1
85		215.0	186.3	59.3	0.9:1
90		170.4	135.8	83.6	0.8:1
105		70.6	60.2	62.4	0.9:1
114		223.2	178.6	51.4	0.8:1
21	Total	6249.8	8609.0	1427.4	

1/ Includes no secondary or changed land use benefits

LEGEND

Approved Public Law 566 Work Plan

Projects Feasible by 1980

B:C Ratio of 1 to 1 or Greater

B:C Ratio of 0.8 or 0.9 to 1

Additional Projects Feasible by 2020

B:C Ratio of 1 to 1 or Greater

LOCATION MAP

LEGEND

Interstate Highway

U.S. Highway

State Highway

County Line

National Park Boundary

Indian Reservation Boundary

Basin Boundary

15 Planning Units

Figure 51

PLANNING UNITS FEASIBLE PROJECTS

IMMEDIATE (1980) AND FUTURE (2020)

KISSIMMEE-EVERGLADES AREA

FLORIDA

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
GAINESVILLE FLORIDA

APPROXIMATE SCALE
1:2,000,000

Base compiled from 4-R-29988, USGS quadrangles and county highway maps
All planning detail taken from these sources

1-72 4-R-31,323

May 1971

7-71 4-R-30402

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TABLE 7-4. - Benefits and costs for additional feasible planning units to meet future needs - Kissimmee-Everglades Area (By 2020)

Planning Unit Number	Total Annual Costs	Total Annual Benefits 1/	Total Acreage Land & Water	Ratio Benefits To Costs
	1000 Dollars		1000 Acres	
4	150.7	155.0	65.5	1.0:1
10	33.2	32.4	20.4	1.0:1
13	167.8	184.1	101.9	1.1:1
14	88.9	97.8	54.9	1.1:1
21	150.2	158.1	73.7	1.1:1
23	168.2	261.1	103.2	1.6:1
25	96.6	106.0	35.5	1.1:1
28	58.6	92.9	35.9	1.6:1
29	61.0	85.3	24.9	1.4:1
30	277.7	355.0	88.8	1.3:1
35	116.4	307.8	47.6	2.6:1
36	17.8	25.5	10.9	1.4:1
37	64.9	134.8	29.9	2.1:1
40	147.5	162.5	60.3	1.1:1
42	178.3	221.3	106.5	1.2:1
44	157.9	394.3	64.6	2.5:1
45	153.0	209.0	75.1	1.4:1
46	208.8	233.7	102.4	1.1:1
47	204.0	349.1	100.1	1.7:1
48	134.4	260.9	55.0	1.9:1
49	69.0	123.4	28.2	1.8:1
54	277.8	463.5	102.2	1.7:1
56	208.3	273.7	76.7	1.3:1
61	113.4	506.5	35.6	4.5:1
62	99.5	148.7	48.8	1.5:1
63	106.7	118.2	43.6	1.1:1
77	270.5	492.4	99.5	1.8:1
78	140.6	192.4	51.8	1.4:1
79	220.3	402.8	90.1	1.8:1
88	319.2	325.0	156.6	1.0:1
89	293.5	356.3	120.0	1.2:1
91	99.0	121.1	72.8	1.2:1
92	186.0	319.0	91.4	1.7:1
33 Total	5,039.7	7,669.6	2,274.4	

1/ Includes no secondary or changed land use benefits

Costs for units 27, 30, 51, 58, 64, 67 and 80 were developed individually based on existing plans of improvement or calculation of quantities developed from U. S. Geological Survey quadrangle sheets. The estimated costs presented for all other planning units were determined by using costs per square mile from similar P.L. 566 work plans or preliminary investigations. These costs were derived by comparing average slopes of the watershed, percentages of crops involved in the agricultural enterprises and amounts of existing structural works already in place. All costs were updated to 1968 prices by using the Engineering News Record Price Index for construction work.

Benefits used in justification of structural measures for planning units were based on a comparison of future land use conditions without projects and future conditions with projects. No benefits were claimed which would result from land use changes. Only primary benefits were evaluated and these are mainly in the form of reductions in floodwater damage, and agricultural water management benefits. Adjusted normalized prices were used in developing agricultural values, and an interest rate of 5 3/8 percent was used for amortization and discounting purposes.

Agricultural Impacts

The purpose of this analysis is to estimate the physical and economic effects of additional water resource development proposals if implemented in the Kissimmee-Everglades Area. No attempt is made to separate the problems of drainage and flooding because of their similar nature due to the area's flat topography. "Without development" is defined as "all projects both private and public in place in 1968 and all projects authorized by December 31, 1968." It also includes the amount of private development that is expected to occur with or without federal or state development. "With development" includes the additional development proposed in this report.

Sub-Areas

The Basin was divided into three areas in this analysis. These areas were selected in order to analyze the geographical effects of water resource proposals. These three areas are referred to as the Northern Area, the Central Area and the Southern Area, (Figure 52).

The Northern Area is composed of Highlands, Lake, Polk, Orange, Osceola, Martin and St. Lucie counties. Although the latter two counties are not conterminous with the others, they are major citrus areas and are more similar to these counties than those in

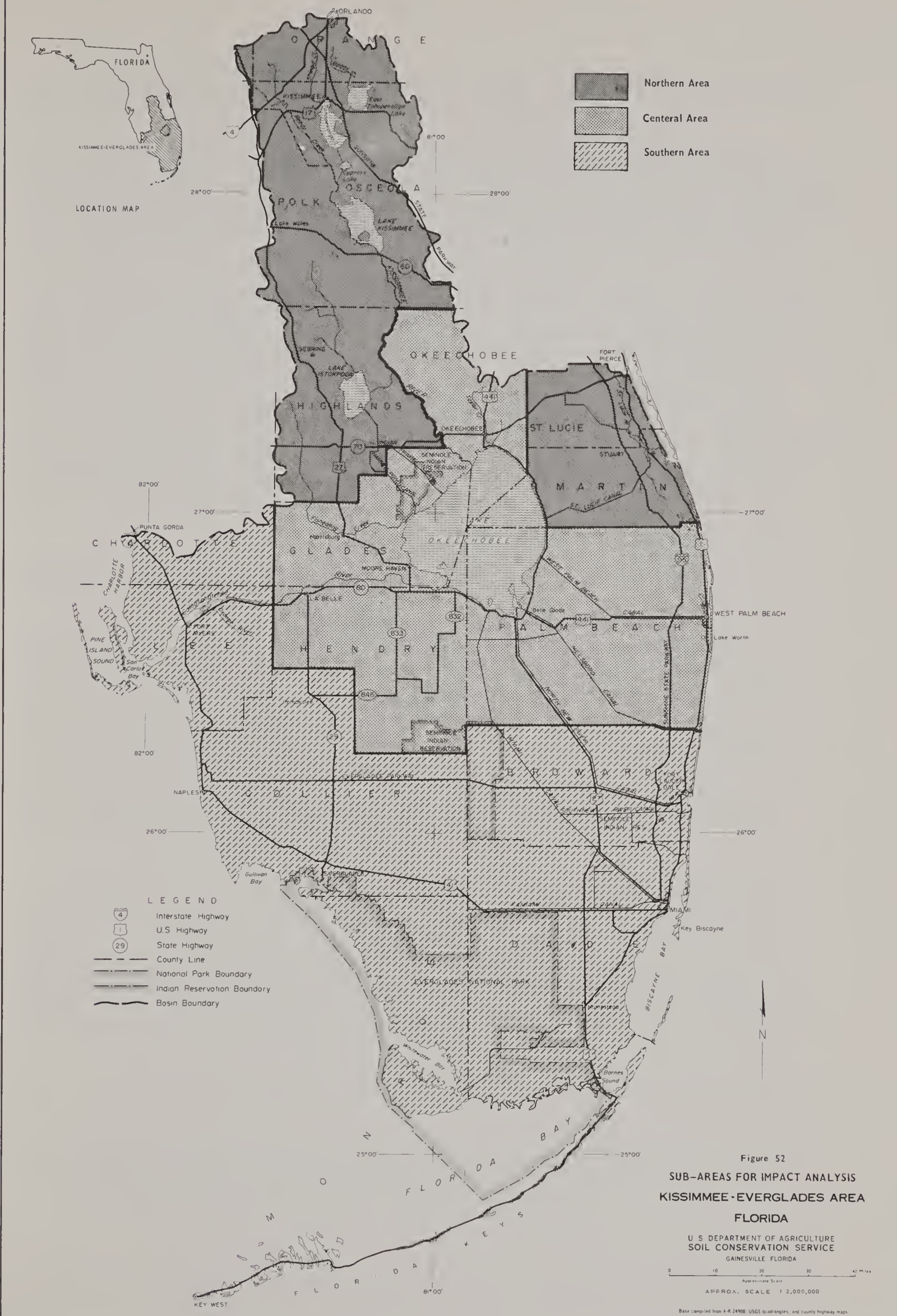

Figure 52

SUB-AREAS FOR IMPACT ANALYSIS

KISSIMMEE-EVERGLADES AREA

FLORIDA

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
GAINESVILLE FLORIDA

0 10 20 30 40 Miles
Approximate Scale

APPROX. SCALE 1 2,000,000

Base compiled from 4-R 24908, USGS quadrangles, and county highway maps
All planimetric detail taken from these sources

5-72 4-R-31,659

USDA-SCS-FT WORTH TEXAS 1972

May 1971

4-R-24908-A

any other area. In 1968, 78 percent of the Basin's citrus acreage was grown in this 7-county area.

The Central Area contains Glades, Hendry, Okeechobee and Palm Beach Counties. This area has 53 percent of the Basin's vegetable acreage and 99 percent of the Basin's sugarcane in 1968. Okeechobee is a livestock county and located north of the other counties in the group.

The Southern Area contains Broward, Charlotte, Collier, Dade, Lee and Monroe Counties. Over 1.8 million people, or approximately 75 percent of the Basin's population, resided in this area in 1968. This area is receiving urban pressures and agriculture is declining. In Monroe County there is no agricultural land at the present time. In Collier County, the future for agriculture is limited because of drainage problems. No agriculture is projected for Lee County in 2020 and only a minimal amount in Dade and Broward Counties.

Acreage Affected by Proposals

A large amount of acreage with primary drainage outlets are included in "land with major drainage or flooding problems" because secondary outlets have not been installed, or existing secondary works have not been updated as development progresses. About two-thirds of the acreage adequately drained is in the Northern Sub-Area while over half of the land with major water problems is in the Central Sub-Area (Table 7-5). Almost all of the potential agricultural land in the Southern Sub-Area will have major water problems by 2020 unless additional water resource development is provided.

An estimated 1.1 million acres[1/] would be benefited if water resource projects were installed that appear to be feasible based upon preliminary investigations (Table 7-6). About two-thirds of the acreage affected is in the Central Area. No reservoirs or irrigation projects are included in the proposals. The benefits were based on earlier projections of land use made with the aid of the linear programming model.

1/ A larger acreage could be affected by these projects. However, it was assumed that only 75 percent of the farmers would install the necessary on-farm drainage measures.

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TABLE 7-5. - Maximum acreage available for agriculture use by protection level without additional public water resource development[1/] - Kissimmee-Everglades Area, 2020

Sub-Area	Agricultural Land 2020: Land Without major drainage or flooding problems	Agricultural Land 2020: Land With major drainage or flooding problems	Total "Without development"
	Thousand acres		
Northern	437.6	593.2	1030.8
Central	225.3	1065.4	1290.7
Southern	13.4	321.1	334.5
Basin	676.3	1979.7	2656.0

1/Without development is defined as "all projects both private and public installed by 1968 and all federal projects authorized by December 31, 1968". It also includes 185,100 acres of private development expected to occur with or without proposed projects.

TABLE 7-6.- Acreage benefited by private and public water resource development, Kissimmee-Everglades Area, 2020

Sub-Area	Acreage Benefited: Private[1/]	Acreage Benefited: Public[2/]	Total
		Thousand acres	
Northern	99.8	304.6	404.4
Central	80.8	724.4	805.2
Southern	4.5	45.1	49.6
Basin	185.1	1074.1	1259.2

1/ Assumes approximately a 50% increase in adequately drained land between 1968 and 2020. The exact percentage differs by counties because some land is in authorized projects or does not have a wetness hazard. This assumption is consistent with information used by SCS in developing preliminary project benefits. These projects may require outlets of public agencies. This acreage is included in both the with and without evaluations.

2/ This acreage is the acreage affected by SCS watershed projects that appear feasible under the PL-566 criteria. However, Corps of Engineers and Central and Southern Florida Flood Control District projects are used as outlets for most of these proposals. Thus, they are referred to as public projects rather than those of a specific agency.

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The P. L. 566 Watershed proposals tie in with the overall plan of water management. The SCS projects would serve as the secondary works, taking excess water from groups of farms, and drainage districts to the primary outlets of the Central and Southern Florida Flood Control District Canals. Although no on-farm drainage costs are included in the P.L. 566 project proposals, their costs are included in SCS evaluation of project feasibility. The SCS evaluation assumed that 100 percent of the farmers in the muck area and 75 percent of the farmers in the other areas would install these facilities. These measures would be necessary to realize the expected benefit from the project proposals.

The amount of private agricultural development was estimated by assuming approximately a 50 percent increase in adequately protected land would occur in the future. The exact percentage varied by planning units depending on acreages already protected and acreages in authorized projects. Private development is included in the "without" situation as it is expected to occur with or without development. More than half of the private development is expected to occur in the Northern area.

Land Use Trends

The Basin produced approximately 36 percent of the State's citrus in 1968 or about 29 percent of the nation's total. All of the State's sugarcane, which represents 43 percent of the mainland sugarcane production (for sugarcane and seed) and 52 percent of the State's vegetable acreage are grown in the Basin. Demand for citrus products, vegetables and sugar continue to increase.

Total land used for cropland and improved pasture in 1968 was 1.9 million acres (Table 7-7). This was only 26 percent of the land classified as agricultural. Despite urban encroachment and other non-agricultural demands for land, the acreage used for crops and pasture is expected to increase 600,000 to 700,000 acres from 1968 to 2020, depending on the amount of water resource development. The major increases in acreage will occur in improved pasture with sugarcane and vegetables receiving sizeable increases. The increase in improved pasture will be largely a shift from rangeland. The citrus acreage is projected to remain relatively constant during this period.

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TABLE 7-7. - Land use by sub-areas, Kissimmee-Everglades Area, 1968

Sub-Area	Citrus	Sugar-Cane	Vege-tables	Improved Pasture	Total Crop-Land & Improved Pasture
			Thousand Acres		
Northern	270.3	1.8	7.3	357.3	636.7
Central	53.4	205.0	111.0	636.0	1005.4
Southern	21.8	-	92.1	123.6	237.5
Basin	345.5	206.8	210.4	1116.9	1879.6

Reductions in the forestland acreage will result from urban expansion, highway construction, and changes to other agricultural uses (Table 7-8). The greatest acreage reduction is expected after 1980, resulting in the loss of approximately 5.4 million cubic feet of growing stock and the wildlife habitat, watershed protection and beneficial environmental effects associated with 493,000 acres of forestland. No changes from forestland to other uses were used in justification of U.S.D.A. Water Management Projects.

TABLE 7-8.- Land use with and without programs - Kissimmee-Everglades Area, 1968, 1980 and 2020

Land Use	Without Program			With USDA Project Proposals
	1968	1980	2020	2020
		Thousand Acres		
Citrus	345.5	345.5	351.4	345.1
Vegetables	210.4	225.6	300.9	252.3
Sugarcane	206.8	248.3	314.3	290.4
Other Crops	20.2	20.2	8.0	8.0
Improved Pasture	1116.9	1124.2	1544.6	1555.1
Unimproved Pasture	1948.5	1834.0	580.2	580.2
Forestland	1993.4	1986.7	1493.3	1493.3
Miscellaneous	1394.4	1268.5	1388.8	1457.1
Total Agricultural Land	7236.1	7053.0	5981.5	5981.5
Total Non- Agricultural Land	2813.6	2996.7	4068.2	4068.2
Total Land	10049.7	10049.7	10049.7	10049.7

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National Development Effects

Land Use

Total land needed to meet projected crop and improved pasture production in the Basin with proposed projects would decrease from approximately 2.5 million to about 2.4 million acres (Tables 7-9 and 7-10). Acreages of all crops, except improved pasture, would be expected to decline. The amount of idle agricultural land would increase 134,800 acres without development to 213,100 acres with development. Under "with project conditions" acreage requirements for improved agricultural uses are reduced due to higher per acre yields.

Due to more intensive forest management, increased yields of wood products will require fewer acres of forestland. The planned and potential U.S.D.A. water management projects may improve conditions for stand regeneration and provide better access to forestland. No adverse forestland effects from these projects are anticipated.

Water resource development would have little effect on the citrus acreage in the Northern sub-area. As the muck subsidence occurs in the Central area, a large amount of the remaining land will be inadequately drained. These factors combined with urban pressures in the Southern areas will cause a large increase in vegetable and sugarcane acreage between 1968 and 2020 in the Northern sub-area. The sugarcane acreage in the Northern area in 2020 will increase slightly with development while the vegetable acreage will decline by about 35,000 acres. A reduction in 2020 vegetable acreage will also occur in the Central and Southern areas. Location of grapefruit production will not be affected by development and no major changes in total pasture acreage in each area are expected.

TABLE 7-9.- Agricultural land use without additional public water resource development, Kissimmee-Everglades Area, 2020

Area	Citrus	Sugarcane	Vegetables	Improved Pasture	Total Planted	Other	Total Agric. Land Available
	Thousand acres						
Northern	259.8	67.5	116.9	533.3	977.5	53.3	1030.8
Central	87.4	246.8	157.2	755.7	1247.1	43.6	1290.7
Southern	4.2	-	26.8	265.6	296.6	37.9	334.5
Basin	351.4	314.3	300.9	1554.6	2521.2	134.8	2656.0

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TABLE 7-10.- Agricultural land use with public and private water resource development, Kissimmee-Everglades Area, 2020

Area	Citrus	Sugar cane	Vege-tables	Improved Pasture	Total Planted	Other	Total Agric. Land Available
			Thousand acres				
Northern	260.0	77.4	82.1	541.1	960.6	70.2	1030.8
Central	81.0	213.0	149.3	766.2	1209.5	81.1	1290.6
Southern	4.1	-	20.9	247.8	272.8	61.8	334.6
Basin	345.1	290.4	252.3	1555.1	2442.9	213.1	2656.0

The Southern Sub-area would be affected by development in that it is more marginal as an agricultural production area. Without development, agricultural acreage would decline almost 10 percent in this area. This is an area where land is primarily used for pasture except for vegetable and citrus areas around Homestead, Immokalee and Broward County. This sub-area may become urban if metropolitan areas expand faster than projected. Decisions concerning the Jetport and the federal purchase of the Big Cypress Swamp will affect agriculture in this area but these plans were ignored in the analysis because final decisions have not been made.

Income Effects

In the long run, gross sales of agricultural products would be unchanged with resource development because it would not be expected to change the demand for agricultural products. This would be especially true in this Basin since it supplies a large part of the national production of citrus, sugarcane and winter vegetables. Gross sales from the six major crops would be $779.5 million by 2020 (Table 7-11), with vegetables representing over half the total. Gross sales would increase with development in the Central Sub-area while declines of $17.8 and 4.6 million would be registered in the Northern and Southern Sub-area respectively.

The major effect of resource development from a national development viewpoint is more efficient production of commodities. The difference in net returns from producing a specified production mix can be considered as gains in national economic efficiency. Basin net returns from crop production increased from $249.9 million without development to $293.3 million with development. Thus, despite the fact that projected production can be met without development, there are large efficiency gains that will result from the installation of secondary works of improvement by public agencies. These gains would represent about 43 million dollars

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annually by 2020 in terms of adjusted normalized prices. The national efficiency gains for the Basin are the same as the increase in net returns since production estimates are unchanged by development. This would not be true for each sub-area because there will be shifts in production among these areas.

TABLE 7-11.- Gross agricultural sales, costs, net returns, and national efficiencies with and without proposed development, Kissimmee-Everglades Area, 2020 1/

Item	Without Development	With Development
	Million dollars	
Gross Sales	779.5	779.5
Production Costs	529.6	486.2
Net Returns	249.9	293.3
National Efficiency Gains	-	43.4

1/ Includes grapefruit, oranges, vegetables, sugarcane, grass-clover pasture and other improved pasture.

By 1980, total forestry stumpage values are estimated to reach 5 times the present level and more than double between 1980 and 2020. The large increase in stumpage value between 1968 and 1980 compared with the latter period is due to: (1) the low rate of production in 1968 and (2) only 55 percent of the timber cut being used for products.

Fewer workers will be harvesting and hauling forest products. Payrolls can be expected to increase as more skilled workers will be used and a larger volume of products will be handled.

Investments in an accelerated forestry program and added protection of forestland from fire, insects and disease will cause an increase in the number of forest management personnel. Employment in lumber and wood products industries is expected to decline, resulting in a decrease in total employment attributed to the forest resource and forest-based industries. This decline is expected to be about four percent by 1980 and reach 15 percent by 2020.

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Social Well-Being

Social Well-Being is a concept that is difficult to quantify. One benefit identified by the Water Resources Council's Special Task Force Test Team was the improved distribution of income. An attempt was made in this study to determine if the proposals would contribute to a more equitable distribution of income among areas. In 1968, the average per capita income in the three areas were: Northern $2950; Central $3400 and Southern $3650.

The largest increase in net returns resulting from development occurs in the Central Sub-area which had almost two-thirds of the total acreage benefited. (Tables 7-12 and 7-13). Net returns from agriculture in this sub-area would increase over $34 million annually. Net returns would increase by almost 9 million in the Northern Sub-area while net returns would increase by less than $0.5 million in the Southern Sub-area.

TABLE 7-12.- Gross agricultural sales and net returns by sub-areas, without development, Kissimmee-Everglades Area - 2020

Sub-Area	Gross Sales	Net Returns
	Million dollars	
Northern	372.8	133.4
Central	365.5	109.8
Southern	41.2	6.7
Basin	779.5	249.9

TABLE 7-13.- Gross agricultural sales, and net returns by sub-areas with public development, Kissimmee-Everglades Area- 2020[1/]

Sub-Area	Gross Sales	Net Returns[1/]	Changes in Net Returns
		Million dollars	
Northern	355.0	142.2	8.8
Central	387.9	143.9	34.1
Southern	36.6	7.2	.5
Basin	779.5	293.3	43.4

1/ Difference in gross sales and on farm production costs. No project costs or costs of on-farm drainage facilities are included.

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The two sub-areas with the lowest per capita income in 1968, (Northern and Central) will receive the greatest benefit from water resource development. Thus development proposals would tend to equalize distribution of income among sub-areas although the increase will be small in relation to total per capita income, (Table 7-14). Changes in net income resulting from development divided by projected population for each area showed that net returns per capita would be increased by $27.00 and $8.00 in the Central and Northern sub-areas respectively. No appreciable change on a per capita basis would occur in the Southern Sub-area. Resource development, even of the magnitude proposed, would not be a panacea for a more equitable distribution of income.

Increases in agricultural net returns would be distributed in the same order that both total agricultural sales and agricultural sales per rural resident were distributed in 1964 (Table 7-14). The Central Sub-area had the largest amount of agricultural sales in 1964. Average farm size is very large (1630 acres); consequently benefits per farm are also high. Projected increase in net returns per rural resident would be $342, considerably higher than either of the other sub-areas. Thus project proposals will not redistribute income among the 3 areas within the agricultural sector but it would contribute some to an over-all reallocation among the total population in each sub-area.

Another effect of resource development identified by the Special Task Force was contribution to an urban-rural balance through population dispersion. The enhancement of rural areas by increasing net farm income and alleviating water problems would be expected to encourage families to live in rural areas thereby reducing urban crowding. The attractive climate of the Basin and the large urban areas, such as Orlando and Miami, provide the Basin the potential to disperse population concentrations both inside and outside the Basin.

Farmers Home Administration has 15 major loan programs specifically designed to help carry out a new national growth policy to develop the resources of rural areas, provide new employment and business opportunities, enhance rural environment and upgrade the standard of living for all the people who wish to live there.

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TABLE 7-14.- Per capita income, agricultural sales and increase resulting from proposed water resource development-Kissimmee-Everglades Area

Sub-Area	Per Capita Income 1968	Agricultural Sales 1964 1/	Increase resulting from development 2020		
			Net returns	Per capita	Per rural resident
	dollars	mil. dol.	mil. dol.	dollars	dollars
Northern	2950	119.5	8.8	8.46	96
Central	3400	155.8	34.1	26.79	342
Southern	3650	98.6	.5	.11	2
Basin	3534	373.9	43.4	6.40	99

1/ 1968 Dollars

Environmental Effects

The major environmental effects will be evaluated by environmental impact statements for specific project proposals, when detail plans are formulated. When drainage channels are improved, some degradation of water quality will result until these channels can be stabilized and revegetated, however, revegetation occurs very rapidly in this Basin. They will also have ecological effects on the area. All final proposals will be made with an aim to preserve the natural environment as much as it is realistic to do. Areas such as those associated with the Everglades are unique and once destroyed, can never be replaced. However, the natural environment is being changed daily, as this is one of the fastest growing population areas in the U.S. Water resource development will be necessary to maintain the present standards now enjoyed and environmental change will be inevitable with or without additional development of public agriculturally oriented projects.

The economics of land treatment practices were not analyzed in this study. However, land treatment practices, such as farm ponds and vegetative measures, provide a pleasant view and an orderly use of the resources. One of the aggregate effects of development would be to reduce the land required for crops and improved pasture by over 78,000 acres. This will release land that could be used for forests, recreation areas, or aesthetic purposes.

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The reduction in acreages of agricultural land due to project development may lessen the impact of harmful agricultural chemicals on the environment. Estimates concerning these potential reductions in pollution are beyond the scope of this study.

More intensive management of forestry programs will have impacts on the environment by affecting water quality, soil stability, open space and air quality. The adverse effects will be temporary in nature and be offset by other practices improving environmental quality in the long run. The harvesting of timber causes unsightly conditions for a period of two or three years, until the regenerated stand begins to blend with the surroundings, and the debris has decayed. Burning to reduce logging debris or in connection with site preparation will add smoke and gaseous pollutants such as carbon monoxide, carbon dioxide and hydro-carbons to the air. Increased utilization of logging slash is expected to decrease the amount of debris left in the forest after harvesting operations. The air temperature of logged areas will be increased slightly, with the natural loss of some organic matter. Some degree of soil instability can be expected on cutover areas, especially from skid trails and roads.

Beneficial effects of established forest cover include improved air quality, water quality, soil stability, wildlife habitat and open space conditions. With increasing interest in the quality of the environment, non-timber uses of forestland can be expected to become more important. In many areas, managing groups of trees to enhance natural beauty or for recreational possibilities may be considered the best type of management.

Site preparation adds to the possibilities of soil erosion. However, due to the flatness of the terrain, very little sheet erosion is expected to occur between timber harvesting and the restoration of vegetation on an area. Logging small areas, dispersed over a portion of a watershed, have little or no adverse effects on water quality and enhance the wildlife habitat. These areas will enhance wildlife habitat by providing diversity of cover, food and edge effect. Visual contrast can be enhanced by using curved lines as unit boundaries for cutover areas. Firebreaks constructed on forestland reduce the spread of fires and the resulting corridors provide access for recreationists and openings for wildlife. Revegetating firebreaks increase soil stability and provides food for animals and birds.

Wildfires are detrimental to the total environment creating high ash emissions, large volumes of partially burned gases, pollutants and noxious fumes that destroy habitat and resources. The intensity of wild fires and the acreage they consume is directly related to the quantity of fuel available for combustion.

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Prescribed burning consumes fuel under controlled burning conditions and is beneficial to the growth of herbage and more desirable wildlife plants. Other beneficial effects of prescribed burning are the reduction of forest insect pests and diseases and vectors affecting man. The emission of ash, noxious gases and fumes is lower from controlled fire than from wildfire.

Establishing and maintaining forest cover by planting and seeding operations compensates for the temporary damage to the environment done by timber harvesting and site preparation. With increased forestry activities to meet future demands for wood products, forest stands would be regenerated as quickly as possibly on cut-over areas and a greater number of other areas planted with seedlings or seeded each year.

Regional Effects

Additional regional effects would occur if the Basin were able to increase its comparative advantage. These positive effects, if they were to accrue, would be expected to be offset by negative effects in other areas. No attempt was made to locate such displacement effects. The method used to estimate potential regional effects was to determine the idle acreage by soil resource groupings and then assume that this acreage would be used to produce the crop with highest net returns, if any were positive. Gross sales, production costs and acreages of each crop were then computed, (Table 7-15).

Citrus would increase by 21,000 acres, with or without development. Improved pasture would increase from an additional 93,100 acres to an additional 185,000 acres with development. As a result, net returns would increase from 7.5 million dollars without development to 8.7 million dollars with development. The Northern Sub-area would receive the largest effects if the Basin could increase its comparative advantage. Additional net returns would be realized although they would be $600,000 or less in each sub-area.

TABLE 7-15.- Additional regional development effects on net returns from agriculture, Kissimmee-Everglades Area, 2020

Sub-Area	Net returns Without Development	Net returns With Development	Increase in Net Returns
	Million dollars		
Northern	6.3	6.6	.3
Central	.4	1.0	.6
Southern	.8	1.1	.3
Basin	7.5	8.7	1.2

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These effects can be added to those in Tables 7.11 and 7.14 to obtain total effects from a regional development objective.

Expenditures for construction, operation and maintenance of proposed projects would be expected to generate regional income and employment benefits. No attempt was made to estimate these effects but their magnitude would depend on: (1) whether resident labor or outside labor was used, (2) whether those employed would have been unemployed or under-employed without the project, (3) whether public funds used would have been invested elsewhere within the region and (4) indirect effects resulting from project installation on associated employment, income and investments in the Basin. These effects would also represent national development effects in cases where regional transfers are not involved.

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S E C T I O N V I I I

COORDINATION AND PROGRAMS FOR FURTHER DEVELOPMENT

The Florida Department of Natural Resources through the Division of Interior Resources has the responsibility for coordinating efforts of the state and federal agencies involved in the study of land and water resource use and management. They will also prepare, print and distribute a comprehensive report for the Basin from data collected by them or submitted to them by cooperating state and federal agencies.

Development potentials suggested in this report, based on satisfying projected needs for products, space, services, and other considerations, are in keeping with sound conservation principles. It is recognized that private development will take place whether or not studies are undertaken to determine the consequences or alternatives to these developments, but it is only through comprehensive planning and coordination that development can occur with the least number of problems and adverse environmental effects. Much more emphasis is being placed on the environmental effects of projects than has been observed in the past on similar type projects. This emphasis is well deserved as there have been instances in the past where not enough attention was given to effects on the environment in the planning process.

Alternative Programs

One alternative would be to disregard the works of improvement suggested in this report and to rely upon haphazard future development. To do so, would be hazardous and costly as has been the case in the past when developments proceeded without overall coordination.

Many unique factors must be considered in making projections for this area. Projected land use shifts tend to be more drastic than would normally be expected. The subsidence of the organic soils, especially in the area south of Lake Okeechobee is critical. By the year 2000, it is projected that 88 percent of the

organic soils will have subsided to the point where intensive agricultural production will not be practical.[1/] This will result in a shifting of most of the vegetable and cane acreage from the organic soils to areas of mineral soils. This shift must be planned carefully to minimize problems. Producers will try to stay as far south as possible in order to have the benefit of the milder winter climate.

Many alternatives could affect the rate of land use change. For instance, organic soils on some areas could be transferred to other areas after it has subsided to the point where it will be too shallow and therefore uneconomical to continue farming. This might be accomplished by hydraulic dredge or other means. It would prolong the useful life of the remaining organic soil for many years. With dikes and pumps, the organic material at the bottom of Lake Okeechobee might be used in place, or it may be possible to dredge and pump this material to other local farming areas to build up the remaining organic soil. After most of the peats and mucks have subsided, it might be feasible to expand the surface area of Lake Okeechobee to include the subsided muck areas.

There is also a possibility for storing additional water on Lake Istokpoga by the construction of a dike around part of the shoreline of this lake. This is an area where agricultural irrigation is projected to increase much faster than are most other areas of the Basin. Lake Istokpoga has a surface area of approximately 42 square miles and a drainage area of over 600 square miles. If the present regulation range could be raised 4 feet, the Corps of Engineers estimates that some 130,000 acre-feet of additional storage would be added.[2/] This storage would supply water needed for irrigating hundreds of square miles of farm land between Lake Istokpoga and Lake Okeechobee. Because this land lies at a lower elevation than the surface of the Lake, gravity flow could be utilized. An inventory of irrigation indicated approximately 38,000 acre-feet of water was used in 1968 and the projected 2020 demand is approximately 270,000 acre-feet.

The dike along the shore of Lake Istokpoga would have to extend up several small streams for a short distance and Arbuckle Creek would have to be diked upstream from the Lake for a distance of approximately three miles. Pumps would have to be installed to remove the surface water trapped behind the dikes. A similar but larger system is currently being used on Lake Okeechobee. The Istokpoga area should become much more important agriculturally as more of the organic soils south of Lake Okeechobee become too shallow for cultivation. Increased agricultural activity in the Istokpoga area will be accompanied by corresponding increases in the need for irrigation water.

1/ The Soil Science Society of Florida Proceedings, Volume XI, 1951
2/ Water Resources for Central and Southern Florida, Appendix III, 1968

Urbanization is proceeding at a high rate in this Basin and will cause land use shifts that need careful consideration. Land use planning and zoning should be accelerated so that land best suited for agriculture will be reserved for this purpose, with due consideration given to those areas which will best be utilized for urban expansion due to location or soil suitability. With adequate planning, the Basin should be able to continue producing needed agricultural products to the year 2020 and still provide for urban expansion.

Soil survey studies should be accelerated in order to determine the availability of various soil types and to help determine the best land use for future needs. Soil surveys are also useful in determining suitability of soils for septic tanks, sanitary landfill, roads and streets, foundations, ponds, and many other uses. The depths to rock or water table can be determined from these surveys. Detailed soils information can be used for establishing zoning ordinances in the orderly development of county growth. Accurate soils data helps prevent marginal land from being brought into production with the accompanying reduced crop yields, higher production costs, and the continued risk of crop damage due to flooding and poor drainage. This results in increased land needs, and consequently higher irrigation water requirements. Even the best suited lands will need irrigation water so as to maximize agricultural production as competition for land increases.

There is the possibility that methods will be found to reduce organic soil subsidence rates. Examples are a plastic film to cover the muck or a tar mulch to reduce oxidation. The practice of flooding idle farm land slows oxidation. If methods can be found to reduce the subsidence rate, land use shifts away from the organic soils will be minimized.

The warm climate in the Basin produces a year-round condition for the reproduction of numerous species of insects harmful to agricultural crops. Some advances have been made in biological control of harmful insects, but it seems unlikely that biological control could be completely successful in the immediate future. Extensive research programs are needed to continue the work for biological control. Until biological control can be perfected, extensive research on less harmful chemicals is needed to reduce the impact on the environment.

Biological control of some aquatic weed and plants show promise for the near future. More research is needed in biological and chemical control to solve the problem of massive growth of aquatic vegetation that choke the flood removal systems of the Basin.

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Desalinization is a method that will help meet water needs in certain areas. However, its feasibility for irrigation water is doubtful. Although the water in the Floridan Aquifer south of Lake Okeechobee is too saline for most purposes, it is much less saline than ocean water and would therefore be much easier to desalinate.

The competition for fresh water will increase in many parts of the Basin as urban, agricultural, industrial and other demands increase. In 1970, severe water shortages occurred in some areas. Ground water will have to meet much of the future need. Therefore recharge areas should be located and protected so as to prevent future development from interfering with recharge. The State should consider purchase of some of these recharge areas, if necessary, to prevent development. More study is required to determine the amount of water that can safely be pumped from ground water without seriously lowering the water table. Prolonged withdrawals of ground water at rates exceeding recharge rates can lead to severe problems. Salt water encroachment can result from either movement of salt water inland from the ocean or upward movements from lower strata.

The accelerated forestry program for the Basin includes measures to increase production consistent with increases in national requirements. Such a program is needed nationally if demands for wood products are to be met at comparative price levels. However, because of rapidly increasing population and expected urban development, other uses of forestland may become more important than timber production. Statewide forest fire protection in future years is recommended for maximum use and development of the forest resource for all purposes. It also includes fire protection for pastures, farm buildings and other improvements, muck soil, and assistance to urban fire departments.

The demand for timber products in excess of production could be assigned to another river basin having a higher potential for growing timber and less competition for land. In this case, the going program of tree planting and improved harvesting would be adequate and the production of timber would be done primarily by corporations and forest industries.

Eucalyptus trees can become an important renewable resource as genetically improved strains are available that are an acceptable source of pulpwood. Yields of up to three cords per acre per year, after eight years, can be expected. After harvesting, the eucalyptus stumps sprout and three more harvests can be produced at eight year intervals, before it is necessary to replant the area with seedlings.

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As seedlings, eucalyptus adapted to Florida are sensitive to frost and need several months to grow to hardier saplings before the first frost. Planting must be done in June, July or early August, when there is dependable soil moisture and adequate time for growth before possible frosts in late November or December. Plantings of eucalyptus could extend to the north boundary of the study area, if the recommended species for the freeze-damage zones and sites were used. Detailed information for planting is available from the Florida Division of Forestry.

The investments ($1.5 million by 1980) required to increase timber production under the accelerated forestry program could be spent on the alternative programs listed below:

1. An urban forestry program providing technical assistance to landowners on the management of forestland and care of shade trees in and around centers of population. Included in the program would be provisions for forestry assistance to urban developers in planning and building future cities.

2. Purchasing land and constructing recreational facilities for family-type outdoor recreation. This may include special management practices on forestland to add beauty or prevent site deterioration. Consideration of all the factors associated with enhancement of the environment would be an important part of the program.

3. Research projects to determine the best use of land for recreation and wildlife.

4. Increasing the production of game birds and animals on existing wildlife areas and on non-productive forestland.

5. Maintaining forest cover for watershed protection and enhancement of the environment. This would include wild areas to be kept in their present condition.

The Florida Division of Forestry would be responsible for the administration of the alternative programs in cooperation with state and federal agencies. These programs would furnish a greater number of services to the increasing population which is becoming more urban. Timber production could be confined to an estimated 500,000 acres under intensive forest management. The present level of forest management can be expected to furnish 91 percent of the demand for wood products in 1980 and 49 percent by 2020.

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Other Agency Programs

Other agencies have programs in existence and are continuously studying alternatives for improving or expanding their system. The Corps of Engineers, Department of the Army, has authorizing resolutions and acts covering works of improvement and proposed works within the Basin. Almost the entire Basin is covered by the Central and Southern Florida Flood Control District. This project is approximately 60% complete (1968) and details of the projects are covered in the comprehensive Corps of Engineers reports for the respective projects. The general locations of the existing or proposed works of improvement are indicated on Figure 45.

There are approximately fifty active drainage districts and mosquito control districts located in the Basin, with projects in operation.

Potential Developments Needing Further Coordination With Other Agencies

Existing and proposed USDA activities in the Basin often require coordination with projects of the Corps of Engineers and Flood Control District, since these projects provide major outlets which are necessary for proper operation of USDA works. Continued cooperation is essential among all agencies involved in soil and water resource conservation activities to assure mutual success of the various works of improvement. Most agencies have attempted to plan projects that would have minimum adverse effects on the environment. However, more environmental planning will have to be achieved in future projects to meet needs of all interest groups.

The possibility of storage of water along streams by the construction of dams was found to be negligible in the Basin, but there are areas where dikes could be constructed for the storage of water. This would require pumps of large capacity since the water available would be flood waters on adjoining lands and would need to be removed as soon as possible. An additional benefit of storing these flood-waters behind dikes is that any pesticides, nutrients, or other objectionable ingredients would be prevented from entering the streams and lakes. Using this system, the water could be stored until needed on the farm land for irrigation. This type project could be handled on either the local, state or federal level.

A need for land and water areas for recreational purposes was recognized in the process of projecting future resource use. However, since the request from the sponsoring state agency, the Florida Department of Natural Resources, to the U. S. Department of Agriculture, was for a study and report on the agricultural uses of land and water resources, an attempt was made only to indicate existing and proposed recreational areas (Figure 48) of other state and federal agencies.

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GLOSSARY OF TERMS

Activity Day - Participation by an individual in a specific outdoor recreation activity during any part of a day. "Activity-occasion" is an interchangable term with the same meaning.

Artesian Well - A well deriving its water from an artesian or confined water body. The water level in an artesian well stands above the top of the artesian water body it taps.

Aquifer - A formation, group of formations or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs.

Back Pumping - Reversing the normal flow of channels into the ocean by pumping back into reservoirs.

Basin - A geographic area drained by a single major stream. The Kissimmee Everglades contains small basins including the Kissimmee River, Fisheating Creek and Taylor Creek.

Constant Dollars - Dollars of constant purchasing power measured at a specific point in time. In this study, 1968 dollars are used as the base.

Consumptive Use - The amount of water transpired by the leaves of the crop and also includes the amount of water evaporated from the adjoining soil surface.

Cropland - Land currently tilled, including cropland harvested, crop failure, summer fallow, idle cropland, cropland in cover crops or soil improvement crops not harvested or pastured, rotation pasture, and cropland being prepared for crops, or newly seeded crops. Cropland also includes land in vegetables and fruits including those grown on farms for home use. All tame hay is included as cropland. Wild hay is excluded from cropland and included in pasture and range.

Demand - The amount of a commodity that will be bought at each specified price in a given market at a given time.

Desalinization - The partial or complete removal of salts from a source of water that has excess salts for the use intended.

Evapotranspiration - Water withdrawn from a land area by evaporation from water surfaces, soil and plant transpiration.

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Forestland - Land at least 10 percent stocked by forest trees of any size and not currently developed for nonforest use. Commercial forestland is producing or capable of producing crops of industrial wood and not withdrawn for non-timber uses. Non-commercial forestland is incapable of producing 20 cubic feet per acre of industrial wood under natural conditions, because of adverse site conditions.

Forestland Stocking - The degree of occupancy of land by trees, measured by basal area or the number of trees in a stand compared to a minimum standard, depending on tree size, to fully utilize the growth potential of the land.

Forestland Ownership - Farmer-owned lands are either areas operated as a unit of 10 or more acres from which the sale of agricultural products totaled $50 or more annually, or areas operated as a unit of less than 10 acres from which the sale of agricultural products for the year amounted to at least $250.

Miscellaneous private lands - corporate, are lands owned by private corporations other than forest industry.

Miscellaneous private lands - individual, are privately owned lands other than forest-industry, farmer-owned, or corporate lands.

Forest Types - Forest type is a classification of forestland based upon the species forming a plurality of live-tree stocking.

Pine types: Forests in which longleaf, slash, loblolly, spruce, pond or sand pines, singly or in combination, comprise a plurality of the stocking.

Oak-pine type: Forests in which hardwoods comprise a plurality of the stocking but in which pines make up 25 to 50 percent of the stocking.

Hardwood types: Forests in which hardwoods such as upland oaks, hickory, bottomland hardwoods, or southern cypress, singly or in combination comprises a plurality of the stocking, and pine makes up less than 25 percent.

Gross irrigation requirement - includes the net irrigation requirement plus the amount lost due to the efficiency of application.

Growing stock - Includes live trees of commercial species five inches in diameter at breast height (d.b.h.) and larger from a 1-foot stump to a minimum four-inch top diameter outside bark of the central stem, or to the point where the central stem breaks into limbs.

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Hardwoods - Dicotyledonous trees, usually broad-leaved and deciduous.

Industrial Water Use - Water used by industry for cooling, processing, and sanitary purposes. May be self supplied or municipally supplied.

Industrial wood - All round wood products except fuelwood.

Labor Force - Persons 14 years of age and over who are employed or are seeking employment.

Land Capability Classes - A grouping of soils into special units, subclasses, and classes according to their capability for intensive use and the treatments required for sustained use.

Land resource areas - Broad, geographic areas having similar soil, climatic, geologic, vegetative, and topographic features.

Land Treatment - A pattern of tillage, land use, or land management to alter runoff, reduce sediment production, improve use of drainage and irrigation facilities, or improve plant or animal production.

Levee - Man-made dike to prevent flooding of low-lying areas.

Location Quotient - A number, generally in index form, which shows the relative importance of an industry in a local region compared to the importance of that industry in a larger area.

Muck Soils - organic soils including peats.

Net annual growth of growing stock - The annual change in volume of sound wood in live sawtimber and poletimber trees during a specified period resulting from natural causes.

Net irrigation requirement - The amount of water needed by the crop for optimum production above the amount supplied by rainfall.

Other Agricultural Land (Miscellaneous) - Includes idle land, marsh land (not grazed), rural homesites, private farm roads, cattle pen areas, or any other rural area which is not being used for producing agricultural or woodland products.

Pasture and Range - Land in grass or other long term forage growth that is used primarily for grazing. Pasture and range includes grassland, nonforested pasture, and other grazing land. It may contain shade trees or scattered timber trees with less than 10 percent canopy, but the principal plant cover is such as to identify its use primarily as permanent grazing land.

Per Capita Personal Income - Total personal income divided by total population.

Permeability - The capacity of a soil to transmit fluid. The field coefficient of transmissibility divided by the saturated thickness of the aquifer, in feet.

Personal Income - Income from salary disbursements and other labor income, proprietor's income, property income (interest, dividends, and rental income) and government and business transfer payments. Both cash and in-kind income are included from private and government sources. Personal income is measured before tax deductions are made but it does not include personal contributions for social security.

Planning Units - Study area, usually hydrologic units of less than 250,000 acres for PL-566 Small Watershed evaluation.

Pumping Stations - A pumping station or plant located at the lowest point sump or drainage area used to withdraw the accumulated water to another place.

Rangeland - Land on which the natural plant cover is composed principally of native grasses, herbs or shrubs.

Reserved Area - Consists mainly of Water Conservation Areas and Everglades National Park in these counties. Also includes any public parks or other areas set aside for recreation. Some of this land is wooded, but harvesting of timber would be prohibited.

Rights-of-Way - Includes all public roads and highways. Does not include any rights-of-way inside urban and built-up areas or within "Reserve Areas".

Rural Population - All residents not classified as urban.

Shift-Share Analysis - An analytical technique to measure and classify basin economic growth over time. Growth may be defined in terms of employment, earnings, or income. The technique defines growth in terms of its component parts; namely, growth in the basin due to overall growth of the national economy, growth due to the industry-mix of the basin, and growth due to geographic advantages or differences. The latter component is referred to as the regional share component.

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Softwoods - Coniferous trees, usually evergreen, having needles or scale-like leaves.

Pines: Yellow pine species which include slash, longleaf, loblolly, sand, pond and spruce pine.

Other Softwoods: Cypress, eastern redcedar and white cedar.

Soil Productivity Group - A grouping of soils that have similar cropping patterns, yield characteristics, response to fertilizers, management and land treatment measures.

Standard Industrial Classification (SIC) - The classification of establishments, published by the Office of Management and Budget, by major type of industrial activity in which they are engaged.

Stand Size - Stand size is a classification of forestland based on the size class of growing-stock trees on the area.

Sawtimber stands are at least 16.7 percent stocked with growing stock trees, with half or more of the total stocking in sawtimber or poletimber trees, and with sawtimber stocking at least equal to poletimber stocking.

Poletimber stands are at least 16.7 percent stocked with growing-stock of trees of which half or more of this stocking is in poletimber and sawtimber trees, and with poletimber exceeding that of sawtimber.

Sapling-seedling stands are at least 16.7 percent stocked with growing stock trees of which more than half of the stocking is saplings and seedlings.

Sawtimber trees are live trees of commercial species containing at least a 12-foot saw log, or two noncontiguous saw logs, each 8 feet or longer, and with at least one-third of the gross board-foot volume between the 1-foot stump and minimum saw-log top being sound. Softwoods must be at least 9.0 inches and hardwoods at least 11.0 inches in diameter at breast height.

Poletimber trees are growing stock trees of commercial species at least 5.0 inches in diameter at breast height but smaller than sawtimber size.

Saplings are live trees 1.0 inch to 4.9 inches in diameter at breast height.

Seedlings are live trees less than 1.0 inch in diameter at breast height that are expected to survive and develop.

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Structural Measures - Measures that will delay, reduce, or control flood flows. These measures include water management structures, channel improvements, levees, and diversion channels.

Subsidence - The slow disappearance of organic soil due to gradual oxidation and aerobic bacterial action.

Supply - The amount of a commodity that sellers offer at each specified price in a given market at a given time.

Supply of outdoor recreation - The capacity of outdoor recreation facilities with given conditions of price, accessibility and quality.

Tourist - An out-of-state resident who stays at least one night in the state for reasons other than strictly business transactions. Visitors on shopping trips, those in transit to points outside the U.S., military personnel and students were not classified as tourists.

Type 4 Study - A state sponsored survey of water and related land resources for all or part of a state, in which one or more Federal agencies participate.

Urban and built-up areas - Cities, villages, residential, commercial, and industrial developments of more than 10 acres, industrial sites, railroad yards, cemeteries, airports, golf courses, institutional and public administrative sites.

Urban Population - All persons living in urbanized areas or in places of 2,500 inhabitants or more outside urbanized areas. Places may be either incorporated or unincorporated.

User-Occasion - Participation by an individual in a specific outdoor recreation activity during any part of a day.

Watershed - All lands enclosed by a continuous hydrologic drainage divide and lying upslope from a specified point on a stream.

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